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THE UNIVERSITY OF ALBERTA

The Western Grain Stabilization Program Under An Alternative Stabilization Level

by

LeeAnne B. Gyori ©

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE

OF Master of Science
IN
Agricultural Economics
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THE WESTERN GRAIN STABILIZATION PROGRAM UNDER AN ALTERNATIVE STABILIZATION LEVEL

SUBMITTED BY *LEEANNE BRENDA GYORI*

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTERS OF SCIENCE IN AGRICULTURAL ECONOMICS

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DATE: May 29, 1992

Dedication

To Tim, my Mother, and the memory of my Father

Abstract

In the Prairie agricultural economy, the stabilization of farm incomes has long been a challenge for government policy initiatives, and will continue to be so as some of the factors of instability remain and new ones continue to evolve. Responding to this challenge, the design and refinement of satisfactory stabilization programs must consider the degree of stability offered along with possible changes in the behaviour of program participants. An integral component of this process is the determination of the appropriate level for stabilization to take place; ie. at the level of the individual producer, area, or region.

This analysis examines the impact of changing the stabilization level of the Western Grain Stabilization Program (WGSP) from a regional to a provincial basis. Stochastic simulation is used to generate a five year forecast of the plan under the two scenarios, and the two are compared on a basis of cash flow size and stability, and the programs actuarial soundness.

Changing the WGSP stabilization from a regional to provincial level does not offer any advantages over the existing program. The size and stability of cash flow in each province remain virtually the same under the two plans. In terms of actuarial soundness, there is little overall difference between the two plans. As measured by the programs' account balance at the end of the forecast period, the ending balance for all provinces under the separate provincial accounts program is -$197.54 million, and -$169.58 million under the WGSP. Some differences in actuarial soundness do appear between the programs when examined by individual province; the proposed

program would have negative impacts in Manitoba, positive in Alberta and B.C., and very little change in Saskatchewan.

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I. INTRODUCTION

Designed to increase the stability of the net grain revenue of Prairie producers, the Western Grain Stabilization Plan (WGSP) was enacted by Parliament in 1976. Its introduction followed many years of ad hoc government programs and was the first program specifically designed to address the recurring problem of income instability in the Prairie grain economy.

In 1990 the WGSP was terminated and replaced by other stabilization and income transfer programs. Over the program's history, it was subject to much debate about its consequences. Many of the concerns were focused on issues surrounding the structure of the program and on the consequences of alternative methods of calculating payouts to farmers. Particular attention tended to be paid to the consequences of making the stabilization payments reflect more closely the situation for individual crops, for individual provinces or for individual farms.

In principle, stabilization of farm incomes can take place at any level, with one of the broadest bases that of the region, a narrower one that of the province, a third the sub-provincial region, and a fourth the individual farm. This thesis examines the consequences of changing the base on which stabilization is assessed; from the region to each of the provinces in the region. While successor programs to the WGSP have tended to bring the stabilization base even closer to the situation on the individual farm, this study examines the effects of a partial rather than a complete shift of the stabilization base.

This study seeks to deal with the following issues. The WGSP employed payout triggers based on cash flow data aggregated over the Canadian Wheat Board (CWB) statutory area. Many people believed these were not sensitive to the production characteristics of specific areas or individual producers. Another concern was the ratio between contributions to the plan and payments from the plan. This study attempts to assess, for a series of provincial plans rather than a regional plan, the impact of shifting the stabilization base on: the size of farmers' net cash flow; the stability of farmers' net cash flow; and the actuarial soundness of the program.

To assess the proposed program of provincial rather than regional stabilization, this study develops a model using a process of stochastic simulation, providing estimates of payouts and stabilization account balances under a variety of assumptions about the future magnitudes of prices, marketings and farm expense levels.

A major challenge in developing any stabilization or support program for an industry remains the possibility of the program influencing the decisions of farmers with respect to crop selection, level of input use, and the time or manner of marketing. An ongoing challenge of creating and maintaining satisfactory stabilization programs is likely to focus on selecting alternative approaches which minimize the program effects on such production decisions. The level of aggregation at which the programs operate can be an important element in that choice, and this study will likely be only one among others which might usefully examine, ex post, the impact of using alternative regions as a base for stabilization, and the effects on the degree of stabilization and program costs involved.

II. The Western Grain Stabilization Program

The WGSP was offered from 1976 to 1990/91 on a voluntary basis to Prairie grain producers by the federal government as a means of risk management. The stated objective of the program was to stabilize grain producer's aggregate grain revenue net of cash costs in the CWB designated area, although as will be discussed later, the program also provided substantial subsidies to participants.

A. The Development of the WGSP

The WGSP evolved from many years of government policy initiatives in the production and marketing of the Prairie farm economy. These initiatives have evolved from an emphasis on providing programs to assist in commodity production and marketing, to programs that are less commodity specific and directed more towards income issues; income adequacy in part, but mainly the issue of income stability. As these changes have occurred, the role of the government in the economic lives of Prairie farmers has become greater.

In Canada, the history of government intervention in Prairie agriculture began along-side the pre-confederation expansion and settlement of the Western regions. The federal government considered the agricultural development of the Prairie provinces to be an important component in the building and strengthening of the nation; agricultural growth and the consequent settlement of land provided both raw materials and an outlet for the industries of eastern Canada (Fowke 1947).

The development and promotion of Prairie crop production remained the dominant source of government policy initiatives from the early 1900's until approximately the mid 1900's. During the Depression of the early 1900's, the adequacy of farmer income became a policy issue for the first time. However, the financial losses suffered by the agricultural sector were so severe, and the rural population so large relative to the urban population, that direct income and support programs were too costly for the government to finance. Instead, the federal and provincial governments helped farmers to establish and promote marketing boards, co-operatives, and collective marketing. The Prairie cooperatives, or pools, were established in the 1920's; British Columbia created the first compulsory marketing organization in 1927; and the Canadian Wheat Board (CWB) was formed in 1935 (Forbes, Hughes and Warley 1982, 15).

During the 1950's and 1960's, income transfers from the government to Western farmers remained at a relatively small percentage of their net income - approximately 10 per cent (Fulton, Rosaasen, and Schmitz 1989, 60). However government intervention into agriculture continued growing through other, less direct methods. Many of the policies undertaken during this period reflected the governments' growing appreciation of the negative consequences of instability in commodity production, prices and income, and in the importance of greater market stability.

To alleviate some of the commodity income losses due to weather variation, natural disasters, and the consequent production losses, the federal government introduced the Crop Insurance Act in 1959. The Agricultural Stabilization Act (ASA), which was intended to buffer the prices and revenues of certain commodities, was also introduced by the federal government in 1958.

The ASA has never provided coverage for the Western grains that are under the jurisdiction of the CWB. However, during the 1960's, the prices of the CWB grains were at times stabilized through the actions of the CWB. Fulton, Rosaasen and Schmitz (1989, 74) note that the U.S. and Canada, as major players in the international grain markets, used their market power to induce increased price stability to the markets. The U.S. did so through its use of the acreage set-aside programs and stock holding programs, and Canada through its use of restricted delivery quotas.

In spite of the federal governments' programs and institutions, the Western agricultural economy continued to face many problems during this period. By the late 1960's the grains sector of Western Canada had again become, as it had been after World War II, characterized by excess capacity and many farmers encountered financial difficulties.

By this time, the federal government viewed the social and economic problems facing farmers as persistent and recurring. To develop initiatives that would help resolve some of the chronic weakness of the industry, the Federal Task Force on Agriculture was mandated by the government in 1969 to examine the problems facing agriculture and to recommend appropriate courses of action.

Although the Task Force made many recommendations for corrective action over a wide range of agricultural problems, its main thrust was to recommend a policy orientation that would foster and maintain the market oriented structure of the farming and food industry. The Task Force envisioned the government's role as providing an operating environment which would facilitate a marketing oriented structure, while providing some of the services typically unavailable to small farming units (Forbes et al. 1982, 15).

The Task Force examination of production and price instability was a highlight of the report, and became the cornerstone for policy initiatives on stabilization in the 1970's. The beginning of the 1970's marked a period of transition for Prairie agriculture as changing international trading patterns and macro-economic events created increasing market volatility. The market power in wheat that Canada had enjoyed together with the U.S. began to erode. Trading patterns changed as Australia, Argentina, and later the European Economic Community (EEC) became major grain producers. Large Russian grain purchases, oil shortages, freeing of exchange rates and escalating inflation were economic shocks that increased the price volatility in the international markets (Fulton et al. 1989, 74).

Responding to growing price and output volatility of the Prairie grain markets, the federal government attempted to find appropriate policy responses. In October, 1970, the Honourable Otto Lang, then minister responsible for the Canadian Wheat Board, issued a proposal that would stabilize the net income of Prairie grain producers (Lang, 1970). A revised version of this proposal became the Western Grain Stabilization Program in 1976.

Lang's proposal was a departure from previous stabilization schemes because it focused on income stabilization, rather than upon price support. One of the main objectives of the proposal followed closely from the recommendations made by the Federal Task Force on Agriculture; that the market-oriented structure of the grain market be maintained. To this end, Lang proposed that long-term production figures be used to establish stabilization rates, and that payouts to individual producers be made on a basis of an average of their marketings for the previous three years.

Several years of debate and revisions from producer groups and the provincial governments of Manitoba, Saskatchewan, and Alberta followed Lang's proposal, until it was passed in its final form by the federal parliament as the Western Grain Stabilization Act in July, 1976.

B. Program Details

Seven of the major grains, wheat, oats, barley, rye, flax, canola, and mustard were covered under the original program formulation. The number was eventually expanded to sixteen when the program was modified to include a number of specialty crops.

Each year, program participants and the federal government made levy contributions to the WGSP fund based on a predetermined percentage of eligible gross grain revenues. Cash flow calculations of net grain receipts for the CWB statutory area determined the total stabilization payment to be paid from the fund, which was triggered when the cash flow calculation fell below the five year moving average.

Stabilization Payouts

Originally, annual stabilization payouts were determined only by a cash flow calculation that triggered payouts when current year net grain receipts fell below the average receipt value of the previous five years. However, this calculation did not trigger payouts when receipts per tonne declined if the absolute value of receipts remained above the five year average. To overcome this problem, a second cash flow calculation, the per tonne cash flow method, was added in the 1983/84 crop year.

The per tonne cash flow method was essentially the same as the original cash flow method, but calculated the net grain receipts and five year moving average by tonne. Each year, payouts were calculated using both cash flow methods, with the actual payout being the larger of the two calculations.

When payouts were triggered, participant's payouts were based upon their levy contributions over the previous three years:

$$\text{Participant's Payment} =$$
$$\frac{\text{Participant's Total 3 Year Levies}}{\text{Total of all Producer's 3 Year Levies}} \times \text{Total Stabilization Payment}$$

Table II.1 on the following page, illustrates the two cash flow calculations, and the explanations preceding this table describe the components of the calculations.

Table II.1

WGSP CASH FLOW CALCULATIONS			
	Original Cash Flow		**Per Tonne Cash Flow**
A	Gross cash Receipts	1	Gross tonnes marketed
B	Gross grain expenses	2	Net eligible tonnes
C	Marketing/production ratio	3	Per tonne net cash flow (G/2)
D	Net expenses related only to marketed grains (BxC)	4	Previous 5 year average
E	Net grain proceeds (A - D)	5	Per tonne difference (4 - 3)
F	Eligibility ratio (actual producer sales to $60,000)	6	Potential payout (5x2)
G	Eligible net cash flow (ExF)	7	Participation ratio
H	Previous 5-year average net cash flow	8	Actual payout (6x7)
I	Potential payout (H-G)		
J	Participation ratio		
K	Actual payout (IxJ)		

Source: Western Grain Stabilization Annual Report, 1984-85.

Cash Flow Calculations

1. Gross Grain Receipts (GGR)

Gross Grain Receipts included off-farm sales of: wheat, oats, barley, rye, flax, mustard, triticale, mixed grains, sunflower seed, safflower seed, buckwheat, peas, lentils, fababeans and canaryseed. CWB payments and voluntary levies on crop insurance payments were also included.

2. Gross Grain Expenses (GGE)

Data from the National Farm Survey (NFS) were used in calculating this variable. Because the NFS includes expenses for the production of all commodities including livestock, the WGSP administration found it necessary to develop a method by which expenses would be allocated to the production of the grains covered under the program. The average cultivated acreage allocation (AvCultAc) method was used until the 1987/88 crop year, after which a new method, the Grain and Summerfallow Enterprise Method (GASEM), was adopted.

3. Marketing/Production Ratio (MPR)

This variable expressed gross grain expenses adjusted to include only the costs of producing grain sold or intended for the commercial market. It is the ratio of:

$$\frac{\textit{Intended Marketings of the Sixteen Grains}}{\textit{Actual Production}}$$

Over the duration of the program, the MPR averaged 78 per cent. This is the percentage of gross grain expenses included in the cash flow calculations.

4. Eligibility Ratio (ER)

The purpose of this ratio was twofold: to include as part of the cash flow calculation only those grain receipts which were eligible - i.e. less than or equal to the MERL (the Maximum Eligible Level - discussed on page 12), and secondly, to exclude the proceeds of interested parties such as landlords operating under rent share agreements. For this purpose the calculation of this ratio is made up of two parts:

$$\text{Part I} = \frac{\text{Total Eligible Sales}}{\text{Total Gross Sales of Actual Producers}}$$

$$\text{Part II} = \frac{\text{Total Gross Sales of Actual Producers}}{\text{Total Gross Sales of All Producers}}$$

The average value of the eligibility ratio for the programs duration was 79 per cent; approximately 79 per cent of eligible grain receipts were included in the cash flow calculations.

5. Participation Ratio (PR)

This was simply a ratio of total eligible sales of participants to total eligible sales of actual producers, and was used to adjust the payout calculation to reflect the fact that not all eligible producers participate in the program.

On average, 79 per cent of eligible producers participated in the program during its operation.

Once the annual stabilization payout had been determined using the cash flow calculations, the changes to the program's stabilization account were calculated.

WGSP Stabilization Account

The program's stabilization account was made up of six components: fund carry-in, interest earned, producer levy, government levy, payouts, and fund carry-out.

1. Fund Carry-in

The fund carry-in was the balance in the fund at the start of the year and is equal to the fund carry-out for the previous year.

2. Interest Earned

On monies residing in the fund, interest was calculated on a daily basis at 90 per cent of the rate paid on 90-day treasury bills and paid into the fund quarterly. If the fund was in deficit, interest was then charged on the deficit at the same rate.

3. Producer Levys

About ninety per cent of off-farm gross grain proceeds were eligible for coverage under the WGSP. This limit was called the Maximum Eligible Level - or MERL, and was set at $25,000 in 1976, and later raised to $60,000 in 1983. Based on a percentage of MERL, participants made approximately 2/5s of the levy contributions to the program stabilization account and the federal government contributed the remaining 3/5s.

The rate levied on participants was increased from 2 per cent to 4 per cent of gross grain receipts, beginning in the 1987/88 crop year. This rate was subject to certain changes after 1989:

> (a) *four per cent where, before July 1 of the immediately preceding year, the Minister estimates that there will be a deficit in the Stabilization Account on July 31 of that preceding year.*
>
> (b) *three per cent where, before July 1 of the immediately preceding year, the Minister estimates that there will be an amount standing to the credit of the Stabilization Account on July 31 of that preceding year; or*
>
> (c) *two per cent where, before July 1 of the immediately preceding year, the Minister estimates that the balance in the Stabilization Account on*

July 31 of that preceding year will exceed fifty per cent of the average annual aggregate net grain sale proceeds, as determined pursuant to paragraph 8(1)(e), for the five year period ending on July 31 of that preceding year (Bill C-132).

4. Government Levys

Government levies were paid to the fund at a rate of 2 percentage points above the participant's levy.

5. Payouts

Payouts were calculated by either the original cash flow, or the per tonne cash flow method.

6. Fund Carry-out

The sum of fund carry-in, interest debit or credit, producer and government levys, less payouts. The stabilization account went into a deficit position during the 1985/86 crop year, which continued to build until the programs termination, at the end of the 1989/90 crop year, the account deficit was $1.1 billion.

Table II.2 below, provides a summary of producer and government levys, and total payouts, for the years 1976 to 1989/90.

Table II.2

The Western Grain Stabilization Program
Total Levys & Stabilization Payments by Province
1976 to 1989/90
($ millions)

		LEVYS		
PROVINCE	STABILIZATION PAYMENTS	PRODUCER	GOVERNMENT	TOTAL
Manitoba	772,869	154,100	286,500	440,600
Saskatchewan	2,388,042	487,700	912,400	1,400,100
Alberta	1,137,837	247,900	454,000	701,900
B.C./Other	26,298	5,760	10,585	16,345
TOTAL	4,325,046	895,500	1,663,500	2,558,945

Source: Western Grain Stabilization Annual Reports, 1976 - 1989/90.

C. A Review Of The Studies Examining The WGSP

In a review of the studies involving the WGSP, a number of themes emerge: the influence of the payouts, particularly the subsidy component, upon resource allocation, income and distribution; the degree to which the program stabilized participants' incomes; and proposals to increase the effectiveness of the program.

Although the stated objective of the WGSP was to stabilize producer's net grain receipts, the plan also served as an instrument to transfer money from the federal government to participants. As shown in Table 2 above, the total of producer levys from 1976 to 1989/90 was $895,000,000, and payouts $4,325,046,000. A producer who contributed the maximum yearly levy over the fifteen years would have paid levys totalling approximately $18,525. His/her total share of payouts would have been approximately $86,447, a return of $4.66 for every levy dollar (Western Grain Stabilization Annual Report, 1989/90).

The high returns on producer levys came at the expense of deficit positions for the program's stabilization account. The program made payouts for five consecutive years, from 1983/84 to 1987/88, when international trading pressures developed and participants incomes dropped. The program was not structured for such large payouts, and large deficits were incurred when the program was unable to recover from these payouts.

In 1988, the federal government contributed $750 million to reduce the programs' deficit. At the plans' termination in 1991, the deficit's expected to be approximately $1 billion, bringing the total write-offs to $2.25 billion (Agriweek, April 8, 1991).

There is consensus in the literature that the WGSP payouts had some effect upon production patterns, but considerable debate about the type and extent of the effects.

The Economic Council of Canada (1988, 67) contends that the exclusion of farm-fed grains and the absence of similar programs for the livestock sector resulted in less livestock and more grains being produced. The Economic Council argues that production was affected by the subsidy component, which smoothed prices over time by removing the troughs from the price cycle, in turn leading to production increases and strengthened land prices.

Shaffner (1977, 10) also suggests that the program created production biases, particularly when payouts were high relative to livestock prices. As well, he contends that the income transfers encouraged inefficient producers to remain in the industry.

Other authors also felt that there were similar effects on production, but qualified the circumstances. Fulton et al. (1989, 55) postulate that when prices for program grains were high, the production of non-eligible grains became more attractive because of the levy. Conversely, when prices were low for the eligible crops, production of these crops may have increased so that producers could benefit from the payouts. The authors conclude that the WGSP likely did not have significant impacts on production biases when prices were normal. Without the program however, production may have been lower during periods of low prices.

In terms of the program's ability to stabilize net income, the program reduced instability that resulted from short-term price variations. Fulton et al. (1989) for example, suggest that the program contributed to a more stable income level in the statutory area. Because the payout calculations were based on a five year moving average however, the program was not effective in stabilizing income when prices declined and remained low. For example, payouts were triggered each year from 1983/84 to 1987/88, yet no payouts were triggered in subsequent years when grain receipts continued to drop across the Prairies. As farm incomes fell, the initiation of ad hoc programs such as the Special Canadian Grains Payment (SCGP), became necessary to cover the fall in grain receipts.

Although the program may have stabilized incomes against short term price fluctuations, it did so for the statutory area as a whole, and not necessarily for individual participants. The program was not sensitive to the differences in production across the region. In its use of industry averages, the program may have stabilized the income of producers within the CWB statutory area as a group, but remained insensitive to regional or individual differences. A drought in a certain area for example, would not trigger payouts for the affected producers unless prices or marketings also declined over the aggregate area.

The program's payout calculation was also biased toward certain grains. The production and marketing of wheat was dominant over the value of other eligible grains, consequently the payouts were largely influenced by wheat prices and marketings.

Certain studies on the WGSP focused on proposals for improving the efficiency of the program. A study by Gould, Spriggs, and Koroluk (1988) simulated the effects of splitting the WGSP into separate payment mechanisms, one for each of the seven major crops. Gould et al. (1988) suggest that a separate account structure would provide greater stabilization and actuarial soundness than the payout structure based on aggregated calculations.

Gould et al. (1988) used a stochastic dynamic simulation model to forecast payouts and the stabilization account over a five year period. Five variables were treated as stochastic: seeded acres, yield per acre, current marketings, crop prices, and gross grain expenses. Linear regressions were estimated for the coefficients, and used as a basis for predicting future values. Seemingly Unrelated Regressions (SUR) was used to estimate values of all the variables, except for gross grain expenses, so that the correlation in the error terms across regressions involving different crops would be accounted for. Values for gross grain expenses was estimated with OLS regressions.

The simulation model was analyzed under alternative program scenarios for the WGSP: no program, the current program, and the proposed separate accounts program. The authors found that the current program stabilized net cash flow with respect to all crops taken either individually or as a group. Comparing the separate accounts program with the current program, the authors found that the separate accounts program has about the same stabilizing potential as the WGS program when analysing all of the grains as a group. Analysing the grains individually, the stability of net cash flow measured by the coefficient of variation, changed as follows: wheat, 5 per cent more stable; oats, 26 per cent less stable; barley, 8 per cent more stable; rye, 119 per cent more stable; canola and mustard, both 7 per cent more stable; and flax, 10 per cent more stable.

The authors concluded that there is no significant advantage to changing from the WGSP to separate commodity accounts. The stabilization gains for the major crops were minor, and likely outweighed by the higher expected administration expenses.

D. The New Grains and Oilseeds Safety-Net Programs

In part because of perceived inadequacies of the WGSP and the other stabilization programs such as the ASA, the federal and provincial governments of the late 1980's examined many of their policies and objectives. In the 1989 working document, *Growing Together, A Vision for Canada's Agri-food Industry,* the federal government examined the shortfalls of the current safety-net programs and delineated objectives for judging new programs.

In the document, four "pillars" against which new agricultural policies would be judged were defined:

1. improved market responsiveness;
2. greater self-reliance in the agri-food sector;
3. a national policy which recognizes regional diversity;
4. increased environmental sustainability (34).

For the safety-net programs, seven principles intended to guide the actions by which the objectives of the "pillars" would be achieved, were also established:

1. tools for farmers to plan their own long-term stability;
2. short-term support as adjustments are made toward long-term market trends;
3. a focus on the viability of the individual farm unit;
4. a level playing field within Canada, while recognizing regional differences;
5. participation by federal and provincial governments and producers;
6. objective criteria for determining the existence, extent and response to widespread and multi-year phenomena;
7. sound land use and animal husbandry practices (52).

Underlying these principles of policy reform, is the concept of three lines of defense in the management of farm risk. The objective of the first line of defense is to *promote efficient and competitive production and marketing in the agricultural sector.* The second line of defense is to *enhance short to medium-term stability in the incomes of individual farm units*. The objective of the third line of defence is to *provide a* *response mechanism for assistance to producers where the severity of events is beyond the intended scope of first and second line programs* (Stephens 1990, 13).

Within this framework, some of the criticisms specific to the WGSP as a second-line defense program include: the perception of high WGSA subsidy relative to the ASA; costs are difficult to predict and inflexible; the program is not financially sound, and; the choice to market or farm-feed grains could be affected.

Some of the criticisms levelled against second-line grains and oilseeds programs in general, included: higher subsidies to grains than to red meats and horticulture; inequitable crop insurance subsidy rates among provinces; possibility of GATT challenge against some programs, and; some programs too commodity and program specific (Hedley 1990, 14).

From the examination of the limitations of the existing programs, and within the context of the objectives enunciated in *Growing Together,* the WGSP was replaced in 1990 by two safety-net programs currently in place; the Gross Revenue Insurance Program (GRIP), and the Net Income Stabilization Account (NISA).

Gross Revenue Insurance Program

In Western Canada, GRIP provides coverage for the same sixteen crops formerly covered by the WGSP, and also for farm-fed grains. The objective of GRIP is to provide producers with revenue protection by offering yield and price support in a single program. Comprised of two components, producers have the choice of purchasing both crop insurance and revenue protection, or joining either component singly. Premiums for either component are shared three ways, by the producers and the federal and provincial governments.

Payouts are triggered for the revenue component when market revenue falls below the programs' target revenue. The target revenue is calculated for each crop, and is based on a coverage level, historic yields, and a 15 year indexed moving average price. If gross revenue falls below this target revenue, the program will pay out the difference regardless of the source of the shortfall (i.e. whether it was a yield or price shortfall). This concept has full offsets, where a high yield could offset poor prices or high prices could offset poor yields (Stephens 1990).

GRIP offers several changes suggested to be improvements over the WGSP:

- With farm-fed grains included in the program, it is more neutral in terms of grain marketing.
- Support is provided at the individual farm level. The problem of not receiving payouts because of the use of industry averages is averted.
- Producers' ability to make production decisions is facilitated, because they know their minimum revenue level at the beginning of the production year.
- The program may eventually use cross commodity offsets. Grains will treated as a "basket of goods" rather than individually, causing it to be more neutral towards crop production, and more acceptable under GATT rules.

Net Income Stabilization Account

The objective of NISA is to provide income stabilization for producers of grains, oilseeds, specialty crops, and certain horticultural crops. Producer premiums are based on eligible net sales, and are matched by both the federal and provincial governments. Either one of two events may trigger payouts: if a farmer's net sales fall below the previous five year average; or if his/her net annual income is less than $10,000 (Stephens 1990).

NISA advantages are similar to those cited for GRIP:

- Support is offered at the individual farm level.
- It is commodity neutral, and therefore trade friendly.
- A portion of receipts from livestock sales are eligible, so that farm-fed grains are covered.

The design of GRIP and NISA allows the programs to provide a comprehensive safety-net: when farm incomes are depressed and producer contributions are small, especially at the start of the program, NISA's ability to stabilize income will be limited. However, enrolment in GRIP should supplement this shortfall. When marketing constraints arise, GRIP does not offer income protection because the payout mechanism is based on production, not marketing. In such circumstances payouts from NISA would likely be expected. GRIP's use of long-term average returns will make the payout mechanism insensitive to short-term price variations, however NISA's payout calculations are based on shorter term averages, and should provide interim support (Paddock 1991).

It is unlikely however, that these programs will provide the final resolution for the problem of income instability. Under GRIP, high net revenues for some crops relative to others may create production biases. For example, in the 1992/93 crop year, Manitoba's GRIP guarantees averages of: $230/acre for lentils, $146 for flax,

$132 for canola, $121 for wheat, $100 for barley, and $72 for oats (Agriline, April 6, 1992). Clearly though, more than just the GRIP guarantees will affect producer's decisions. Factors such as the marketability of a crop are also important. Under conditions of high prices and marketability, the revenue guarantees may be expected to influence production decisions.

GRIP is not designed to offset price variability resulting from global trade wars. Under the yield/price offset system employed under GRIP, high yields can offset low prices. Also, the indexed moving average price offers no protection against prolonged price depressions caused by abnormal market interference such as trade wars.

GRIP may also be negatively affected by the problems of moral hazard which are often associated with individually based plans. It is possible for example, for producers to trigger payouts by decreasing the use of production inputs and generating lower yields.

The WGSP was replaced for a number of reasons: it did not provide enough individual stabilization; it was only effective for short-term price swings; production was biased towards eligible grains; the payout calculation was biased toward wheat prices and marketings; and the program was not self-financing.

The new safety-net programs for grains and oilseeds, GRIP and NISA, are a response to some of these concerns, although it is unclear that they alleviate all shortfalls. It is likely that the new programs, particularly GRIP, will evolve towards satisfying the trade-offs between area-wide and individually based programs. As an example of this trend, in early 1992 the Saskatchewan government changed its GRIP formulation to provincial rather than individual yields.

III. INSTABILITY IN AGRICULTURAL MARKETS

A large body of literature exists on the theory of stabilization in agricultural markets. Much of this literature deals with commodity price stabilization more than with income stabilization, but is cited in this study for two reasons. First, the theory of commodity price stabilization has provided much of the foundation for the theoretical study of other stabilization schemes, namely commodity income stabilization. Secondly, price and production instability in agriculture are directly related to the variations associated with agricultural incomes.

As will be examined in greater detail in a later portion of this study, the source of instability in agricultural markets is believed to largely determine the economic consequences for producers and/or consumers. Therefore, identifying the source and nature of instability is an integral part of the process for policy planners when government intervention into stabilization efforts are being considered.

The sources of price and income instability associated with agricultural production may be roughly divided by two types; instability caused by factors on the supply side and instability caused by demand side factors.

A. SUPPLY SIDE FACTORS

Jobin (1984) identifies several supply factors which may lead to commodity price and income instability: natural causes; the effects of production cycles; technological changes; and the nature of both the variable and the fixed inputs to production.

1. Natural Causes

Natural causes, such as yearly variations in rainfall, crop damage and failure due to hail, frost, etc., and the influence of these factors upon yearly fluctuations in production and yield, is one of the major supply sources of commodity price and income instability. Williams (1969, 109) highlights the magnitude of the problem:

> *Weather variations have a profound effect on prairie wheat production. Their economic impact is illustrated by the fact that over $600 million of the difference in value between the 1961 and 1966 Canadian prairie wheat crops can be attributed to the difference in weather conditions.*

The fluctuations in crop yields and production caused by natural factors lead to price and income instability by causing variations in the volume of available marketable production, and by creating commodity price fluctuations as production output changes.

2. Production Cycles

Production cycles may cause income and price instability because of the lag in time between production decisions and the time when the actual marketing of the commodities may commence. Producers may find commodity prices at harvest time to be different from the expectations that they had formed during the planting season. Rather than being able to store their inventory, with the expectation of more favourable market prices, the perishable nature of agricultural commodities dictates that stocks generally can not be held in inventory very long. Producers may be forced to sell into unfavourable markets; adding to existing price volatility and any existing downward pressures (Shaffner 1977).

The uncertainty caused by production cycles, and the inflexibility found in the timing of marketing opportunities, is compounded further by the problems attendant with the capital intensity that typifies many farming operations and the large debt servicing often associated with them. As producers become committed to servicing larger amounts of debt, their ability to carry inventory is further reduced; forcing them to sell commodities at inopportune times rather than being able to plan their sales in a manner which may enable them to reduce their income instability (Shaffner 1977, 14).

3. Inputs to Production

Agricultural inputs are sources of commodity price and income instability, because of the relative lack of price variation for many of the variable inputs, and because of the limited alternate uses for the larger, more capital intensive, inputs.

Most variable inputs such as chemicals and fertilizers, historically have demonstrated little short-term price variation in response to changes in production output. Consequently, when the price of the production outputs fluctuate, and the prices of variable inputs do not, fluctuations in commodity incomes are not typically offset by reduced input costs (Task Force on Agriculture 1968, 25).

The second manner in which the inputs to agricultural production may contribute to instability is due to the relative fixity of the larger, more capital intensive, inputs. In many non-farm industries some of the inputs of production may be idled in response to product price decreases; workers may be laid-off and components of the production process shut down. In agriculture however, producers are only able to use many of the inputs at a less than optimal rate (Shaffner 1977, 14). Land is generally disposed of only over the longer term, as is much of the agricultural machinery and equipment with high capital costs.

4. Technological Changes

The final supply side factor to be considered in the discussion of commodity price and income instability, is technological changes. Technological advances which may cause, for example, decreases in the quantity of inputs needed for a given level of output, or produce increases in the hardiness or yield of a particular crop, can lead to changes in demand for a particular crop and consequent production changes (Jobin 1984, 11). Although technological advances typically generate benefits over the longer-term, over the short-term, the changes in production that they may induce between competing crops can be destabilizing to prices and income.

5. Inelastic Demand & Supply

The influences of all of these factors on supply, and ultimately upon commodity price and income volatility, is further accentuated by the nature of the demand and supply curves for agricultural commodities. The demand and supply elasticities for most primary products are typically, at least in the short run, very inelastic. For example, as the supply curve shifts outward, price decreases will typically lead to increases in product demand which are smaller in magnitude than that of the price change. Therefore, any volatility in supply will not be matched by proportionately equal price changes, and most of the volatility is absorbed by producers' incomes (Jobin 1984, 4).

To summarize, the major supply based sources of variations in commodity prices and incomes include: natural elements such as weather and natural disasters that cause variations in the volumes and prices of production output; production cycles that create price and planning uncertainty and that is further exacerbated by restrictions on the timing of marketing by producers; technological changes which may lead to short-term disruptions as producers adjust their production decisions to assimilate the new technology; the cost of variable inputs which do not fluctuate to absorb any of the changes in the output price; and of the fixed and capital intensive inputs to agriculture for which there are few alternative uses.

Generally, all of these factors interact simultaneously, and by varying degrees, to influence the supply of commodities; hence prices and incomes. And because of the inelastic nature of the demand and supply curves for agricultural products, commodity price and income volatility caused by supply shifts is accentuated.

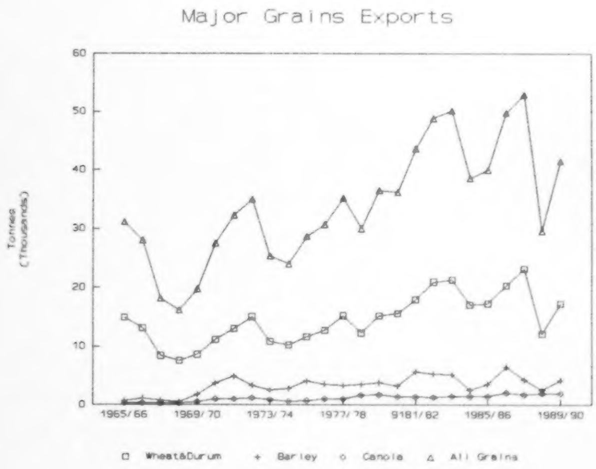
B. DEMAND SIDE FACTORS

Just as there are influences on the supply side that create price and income volatility in agricultural markets, so to are there important influences on the demand side. The factors considered to be the most important, and to have received the greatest amount of attention in the literature, include the export orientation of the Prairie crops; the adoption of technological advances by other countries; and just as the inelastic nature of the demand curves for agricultural products accentuate commodity price and income volatility when supply shifts, supply inelasticity creates price and income volatility when demand shifts.

1. Export Orientation of Prairie Grains

A large proportion of the Prairie crop production is sold into the export markets. Starting from the first part of the 20th century, Prairie grain receipts, particularly for wheat, have come to increasingly rely upon export markets. In 1989 for example, over 85 per cent of Prairie wheat production was exported (Fulton et al. 1989). Approximately 40 per cent of aggregate farm income is derived from export sales (Forbes et al. 1982, 39). In Figure 1 below, the historical upward trend in the export of Prairie grain production is illustrated.

Figure III.1



Source: Canada Grains Council

The reliance of Prairie grain receipts upon export markets has induced added variability to grain prices and incomes. Crop production has become increasingly specialized, and the exposure of Prairie farm incomes to macro-economic disturbances and changing trade patterns of the international markets has increased.

In response to export demand, grain producers have increasingly specialized. From 1926 to 1987, the production of Prairie wheat has increased by 50 per cent, with the bulk of this production sold in export markets (Fulton et al. 1989, 18).

Reliance on a small number of crops leaves the incomes of producers exposed to all of the price and production variability associated with those crops, with limited income protection available from other cropping alternatives.

With so much of the Prairie grain production tied to export sales, a large proportion of production income and market prices are subjected to the influences of international interest rates and currency fluctuations. Interest rate and currency fluctuations are closely tied to the health of the world economy and the internal policies of the major trading partners. High domestic interest rates, with a correspondingly strong Canadian dollar, generally hinder export grain sales. Similarly, the currency fluctuations of importing countries also affects the flow of grain sales; with weakened currency situations making grain imports more expensive and less attractive.

Trading patterns in agricultural products are directly affected by the internal policies and the economic health of other countries. Over the years, the trading positions of many of Canada's traditional grain customers has changed from being net importers to becoming self-sufficient, and sometimes even becoming net exporters (Fulton et al. 1989). Examples of political and economic influences that have induced changes in world trading patterns includes the EEC's objective of maintaining a secure and indigenous food supply and the consequent change in its trade position from being a net importer of certain grains, to becoming a net exporter. The demand for lower grades of wheat has increased as the economic welfare of developing countries has improved, and their demand for feed wheats grown.

Reflecting the changing patterns of the world grain trade is the relatively dramatic decline in Canadas' share of the international wheat market over the past twenty years. In the 1950's, Canadian wheat sales enjoyed approximately 40% of the world market share; this share has declined to between 17% and 23% over the past 20 years (Economic Council of Canada, 1988).

Declining market share and changing trade patterns have created commodity price and income volatility by decreasing the certainty of export market sales, and by changing the demand for the type or grade of grain as policies and the economic conditions of grain trading countries change.

2. Technological Changes

Technological changes have influenced the international pattern of import and export demand. Major grain exporting nations such as Canada and the U.S. are usually the first to benefit from government funded research in areas such as improved plant varieties, yield, hardiness, etc. However, both countries have been confronted with changing trade patterns as these research developments have in turn been adopted by industrial and third world countries who use the technology to advance their own crop production.

3. Inelastic Supply Curves

Just as inelastic demand curves accentuate price and income volatility when there are supply shifts, the inelastic nature of the supply curves for agricultural products cause commodity price and income volatility when shifts in demand occur.

Over the short-term, supply curves for agricultural products are very inelastic, because as previously noted, the supply of primary products tends to be stable, largely due to the fixed nature of many agricultural inputs and the high capitalization of many farms. With the supply of agricultural products virtually fixed in the short term, changes in demand are not met with corresponding changes in supply, and rationing occurs by product price changes.

For the Prairie grain economy, the influence of the export markets is a key determinant in the relative stability of commodity prices and income. With approximately 80 per cent of Prairie grain production sold into the export markets, instability is a consequence of the specialization in the production of export crops, and the economic and political influences of the international markets. Technological advances in turn contribute to the shifting international trade patterns, as countries adapt their production mixes to incorporate new crop varieties and characteristics. All of these influences are accentuated by the inelasticity of the demand and supply functions of agricultural commodities, creating even more price volatility when demand shifts.

C. Contingency and Forward Markets

Stabilization schemes are often instituted even though other mechanisms, such as forward and contingency markets, may already be in place. Forward and contingency markets offer some degree of price or income stabilization by providing future price information and risk management. But stabilization schemes are generally believed to provide additional stabilization benefits because forward and/or contingency markets, by their very nature, can not provide either complete pricing information or risk management. And when these risk-sharing arrangements are not complete, market failure occurs and economic losses are incurred as producers are unable to protect themselves from price or income variations.

Under hypothetical conditions where forward and contingency markets are complete, stabilization schemes are considered to offer additional benefits. When the government participates in program funding, money is transferred to participants. And to the extent that they can anticipate program payouts, producers have improved sources of price information. For practical purposes, the existence of forward/and or contingency markets complicates the assessment of the economic benefits of stabilization programs. Ignoring their stabilizing effects will usually result in the economic benefits of stabilization programs being overstated, and the distribution of benefits being different from what they would have been in the absence of such schemes (Newberry and Stiglitz 1981, 176,169).

1. Forward Markets

Forward markets provide information about price expectations for a future period in time. In agricultural markets, there are several different types of forward markets: futures contracts, forward contracts, options on futures contracts, etc. The contract settlement price signifies a market clearing price, which serves to coordinate the future plans of producers and consumers.

Forward markets are complete when all the possible forward claims that agents would wish to write are available (Myers and Oehmke 1987, 9). When forward markets are not complete, producers and consumers of a product are unable to coordinate their future plans. Producers, not knowing the future plans of the consumer, may produce either too much or too little of the product and the market will fail to clear. Similarly, consumers unable to match their future plans to those of the producer may, for example, make incompatible processing decisions (Myers and Oehmke, 1987).

Newberry and Stiglitz (1981) cite market failure as a consequence of inadequate information. Lack of information is closely related to the concept of incomplete forward markets; because forward markets, when complete and operating efficiently, provide full pricing information to producers.

Despite the variety of forward pricing options, the quality and quantity of information necessary for efficient markets is typically lacking in agricultural markets. Information is costly to provide and typically has the characteristics of a public good. Forward markets exist for only a limited number of commodities, and those that do exist, typically offer forward pricing for only a little over one year. The fact that futures contracts do not have expiration dates much beyond one year is often attributed to the prohibitive cost of providing longer-term contracts (Omeke and Myers, 1987). If futures contracts were available for longer terms, producers would have more information on which to base longer-term production decisions, and greater ability to effectively manage risk.

2. Contingency Markets

Contingency, or risk markets, allow producers to pool or transfer risks to individuals willing to assume it. They are complete when all risks, in the context of the existing market structures, are insurable. Examples of contingency markets include: futures markets, options, insurance markets, and stock and bond markets. A futures contract may also serve as a contingency instrument because it allows producers to transfer the risk of commodity price changes to another party (Myers and Oehmke 1987, 14).

Contingency markets often are not complete because of the problems of moral hazard and adverse selection associated with insurance schemes. With moral hazard, the insured party may not take the same care in assuring successful crop production as would have done without insurance. And with adverse selection, those most likely to be the poorest risks are the ones most likely to purchase insurance (Newberry and Stiglitz 1981, 207).

For markets to be efficient, both futures and contingency markets must be complete. Even if forward markets are complete for example, without a complete set of risk markets, producers can make neither complete risk assessments nor production decisions based on full pricing information (Spriggs and Van Kooten 1988).

D. Market Failures And Economic Losses

When market failures do exist, and producers and consumers are unable to protect themselves from price and income volatility, economic losses, and sometimes economic gains, may occur. Production and investment decisions are affected, and the market may operate at a less than optimum efficiency.

1. Producer's Economic Losses

For producers, commodity price and income instability coupled with market failure, forces a certain number to leave the industry. Without future pricing information to facilitate and coordinate planning, and contingency markets to transfer risk, the effects of price and income volatility are not attenuated. Inefficient producers, unable to withstand income volatility are amongst the first to leave the industry. However, farmers who are not necessarily inefficient operators may also be forced out: highly leveraged farmers carrying high debt commitments but with otherwise efficient operations; and producers unwilling to continue assuming risks may also be forced to exit the industry (Jobin 1984).

Instability is also assumed to affect the way in which producers make their investment decisions, although there does not appear to be a consensus in the literature whether investment is hindered or actually fostered by commodity price and income instability.

Johnston (1947) argues that producers faced with commodity price uncertainty and market failures react by rationing capital with the purpose of securing a more consistent income flow over time; that the economic consequence of capital rationing is production decreases and efficiency losses as resources are not used at their optimal capacity.

Robinson (1975) however, contends that farm income variability actually leads to increased investment. He hypothesizes that producers, in an effort to avoid taxation, will make capital investments in the years when their incomes are high relative to other years.

2. Economic Losses by Consumers

The consumers of agricultural products, and industries both upstream and downstream of commodity production, may also suffer economic losses from unstable commodity prices and market failures. Without complete futures markets for these industries to base pricing decisions on, or complete contingency markets that would allow them to assess and transfer risk, it may be difficult for them to withstand the price and income fluctuations.

An unstable supply of market goods for example, creates efficiency problems for the marketing sector; if it is structured to handle the largest crop production, periods of under-utilized capacity are likely to occur. Similarly, if it is structured to handle the smallest crop, periods of congestion are likely to occur (Tomek 1969).

The impact of economic losses experienced by fertilizer and chemical companies, manufacturers of farm machinery, food processors, etc., on the health of a country's overall economy, depends upon the role of the agricultural sector in the country's economy. The size and significance of the sectors' economic contribution; the importance of import and export activities and their contribution to the economy's balance of trade, all determine the extent to which commodity price and income instability will impact on the general economy (Jobin 1984).

The condition of commodity price volatility does not necessarily mean that producers and consumers will suffer economic losses. Rather, it is when market failures also exist and producers/consumers are unable to attenuate price volatility that losses will occur. For producers, the purchase of capital investments is likely to differ from the pattern and rates of investment that would be found in a market where prices are stable.

IV. MODELLING THE EFFECTS OF PRICE STABILIZATION

Over the years, many theories have been developed to measure the economic consequences of commodity price stabilization. A survey of these theories reveals that over time, measures of the economic benefits of price stabilization has declined as the models have been modified and adapted to better represent producer behaviour and actual stabilization programs. Some of the early models postulate relatively substantial economic gains from stabilization. Models developed in more recent years however, place more emphasis upon modelling producer's price expectations. These later models postulate that price stabilization schemes will tend to result in much smaller economic gains than estimated using the earlier models.

The earliest price stabilization theories were developed by Waugh (1944) and Oi (1969), and later, Massell's (1969) synthesis of these two theories. These models provided much of the framework from which many of the later stabilization theories were developed. In the simplest terms, the models postulate that price stabilization will result in economic gains for either the producers or consumers of the product; which group will benefit is dependent upon the source of the price instability.

In Waugh's price stabilization model, consumers are shown to benefit (consumers surplus), and producers suffer economic losses when supply is volatile with demand held constant. Oi's model is very similar to Waugh's, but instead of consumer surplus, it hypothesizes that there will be producer surpluses, and losses to consumers, when demand fluctuates and supply is stationary (Newberry and Stiglitz 1981).

Massell synthesized the models of Waugh and Oi, and incorporated the concepts of producer and consumer surplus into a single model. In the Massell-Waugh-Oi price stabilization theory, the economic inefficiencies caused by price instability are compensated by the economic gains derived from stabilization. The economic surplus enjoyed by either the producer or consumer group more than offsets the economic losses suffered by the other group, which can result in a net welfare gain (Newberry and Stiglitz 1981, 18).

Among other criticisms, the price stabilization theories of Waugh, Oi, and Massell are faulted for not accurately representing the behaviour of agricultural producers or of the market place. These models assume that when producers and consumers make their marketing decisions, they have perfect information; that decisions are based only on spot market prices, which are known with certainty. No assumptions are made about the future price expectations of producers.

However, it is more typically believed that because of the nature of the agricultural industry, producers are unlikely to base their production and marketing decisions only upon the current prices. Turnovsky (1974) for example, suggests that producers are faced with price uncertainties because of the agricultural production cycle; the lag between production input decisions and the actual product marketing, and because of this are most likely to form expectations regarding future prices, rather than basing production and marketing decisions only upon spot prices.

When it is assumed that producers do form expectations regarding future prices, rational expectations theory is typically used to model their behaviour. Rational expectations theory hypothesizes that producers will seek to incorporate as much of the available market information as they can to form price expectations, which in turn they use to base their production and marketing decisions on.

The theory of rational expectations to model producer behaviour has become widely accepted, i.e. Huntzinger (1979); Goodwin, Thomas and Sheffrin (1982); and Newberry and Stiglitz (1981), because it is considered to realistically reflect the behaviour of agricultural producers.

The most notable consequence of modelling producers' behaviour using rational expectations theory is that the economic benefits of price stabilization are typically measured as being less than the models that use the assumptions of the earlier stabilization theories - i.e. the Oi-Waugh-Massell model. The principle reason for this difference is that under the assumptions of rational expectations theory, producers are assumed to use all of the available market information to base pricing predictions on. Even when market failures occur, producers are able to rationally piece together existing information so that their losses are less than would be anticipated in a model where rational expectations are not assumed (Myers and Oehmke 1987, 12). Similarly, these producers are in less need of stabilization programs, and the benefits that they will receive from the programs will not be comparable in magnitude to the benefits received by producers assumed to make accurate price predictions.

Scandizzo, Hazell, and Anderson (1983) demonstrate that measures of the economic benefits of price stabilization vary widely depending on the modelling of producer price expectations. They estimate economic gains using two different assumptions: one, that producers form rational expectations; secondly, that producers' price expectations are based on lagged prices.

Using a buffer stock plan to stabilize price, Scandizzo et al. estimate that for each tonne of wheat marketed (at $200/tonne) in a stabilized market, the net welfare gain is $3 when the assumption of rational expectations is used, and as high as $60 when a lagged expectations (adaptive expectations) model is used.

There is no consensus in the literature regarding the appropriateness of using rational expectations theory to model producers pricing behaviour. However, this theory illustrates that the measure of economic benefits of price stabilization vary widely depending on how price expectations are modelled. It also demonstrates that it is reasonable to expect that the benefits will be less than those measured using the earlier models that did not incorporate future price expectations.

V. ANALYSIS OF THE WGSP UNDER SEPARATE PROVINCIAL ACCOUNTS

To analyze the effects of changing the WGSP to provincial payouts, a five year ex-ante forecast of the program using provincial and area-wide data is made. The methodology for the forecast is stochastic simulation. Stochastic simulation generates trend extrapolations from the principle variables in the cash flow calculations - price, marketing, and expenses, and uses these values to generate five forecast iterations of the payout calculations and of the stabilization accounts. The appropriateness of using stochastic simulation is fully discussed later in this chapter.

The first step of the analysis involves estimating all of the cash flow variables provincially and area-wide for the years 1960/61 to 1986/87, and calculating separate provincial stabilization accounts for the years 1976 to 1986/87. This step provides the historical cash flow data and stabilization account balance from which the forecast extrapolations are made.

Using the historical cash flows and stabilization accounts, the second step uses stochastic simulation to generate forecasts of cash flow calculations and the consequent payouts, levys, and stabilization account balances under the proposed and WGSP programs.

A. Estimation of the Historical Cash Flow Variables

Data for the variables used in the two payout calculations were collected and calculated both provincially and area-wide on a crop year basis for the years 1960/61 to 1986/87. Using a LOTUS-123 computer worksheet, the variables were arranged to simulate the WGSP payout calculations for each province, and area-wide. The results of these calculations are show in Appendix A.

1. Gross Grain Receipts (GGR)

Gross grain receipts includes: wheat, oats, barley, rye, flax, canola, mustard seed, and Canadian Wheat Board payments by crop year. *GGR* is split into marketing tonnes and average grain prices.

2. Gross Grain Expenses (GGE)

The WGSP administration uses a long and complicated methodology for calculating *Gross Grain Expenses*. Attempting to duplicate this methodology to generate appropriate provincial data is beyond the scope of this study. Neither is it appropriate to attempt to divide the WGSP derived expense data among the provinces, because doing so would ignore differences in production expenses between the provinces. Although cropping expenses would not be expected to vary widely between the provinces, there are some expense items which may be clearly distinguishable between provinces. Irrigation is one example. Although primarily an expense within the southern Alberta crop growing area, this expense is calculated on a per acre basis over the entire CWB area under the WGS program.

For these reasons, and for the purpose of this study, an alternative method for estimating GGE on a provincial basis is used. Using Statistics Canada data, Gross Grain Expenses is measured for both the current and the proposed plan by taking:

100% of Fertilizer and Crop Expenses: fertilizer and lime, pesticides, seeds, and irrigation.

75% of all Machinery Expenses.

65% of Cash Costs: wages to agricultural labour, property taxes, repairs to buildings, electricity and telephone.

The *Gross Grain Expense* variables derived by this method correspond closely to the expense data used by the WGSP in their payout calculations. The two expense calculations are compared in Appendix A, Table 6. However, two additional adjustments were made to the calculations developed using this procedure.

First, for the years 1971 and 1972, the expense calculations using Statistics Canada data were greater than the WGSP calculations by 11 per cent and 12 per cent respectively for each of the three provinces. Since the WGSP's method, Grain and Summerfallow Enterprise Method (GASEM), emphasizes adjusting expenses for changes in summerfallow acreage, it is assumed that this difference between expense calculations is due to the large change in summerfallow acres related to the implementation of the LIFT program. Therefore, for the years 1971 and 1972, expenses are measured under the alternative method by using the WGSP calculations and dividing them between the provinces. This is done by multiplying each province's respective percentage of the total Statistic Canada expense data (100 percent of each expense item) by the WGSP's *Gross Grain Expense* data for the respective years.

Second, *Gross Grain Expense* for British Columbia had to be measured indirectly. In B.C. only the Peace River district is within the CWB designated area and consequently included in the WGSP. It is not feasible to attempt to calculate expenses for such a small area from provincial expense data. Therefore, since the Peace River district has much of the same production expenses and characteristics as many districts in Alberta, Alberta's *Gross Grain Expenses* is calculated on a per hectare basis and this average applied to the total number of hectares sown to the seven grains in the B.C. Peace River district.

3. Marketing Production Ratio (MPR)

$$\text{Marketing Production Ratio} = \frac{\text{Acreage Under Crops Intended for Market}}{\text{Total Acreage Under Crops}}$$

The MPR is intended to measure the proportion of the seven eligible crops intended for market against the total acreage sown to those crops. This ratio is used to adjust *Gross Grain Expenses* so that the resulting *Net Grain Expense* reflects only those expenses which are attributable to the production of the eligible crops (Western Grain Stabilization Program Report 1986, 2).

Looking at the components of the ratio, the denominator - *Total Acreage Under Crops* is the total acreage of the seven eligible crops in the CWB designated area. *Acreage Under Crops Intended for Market* measures the number of sown acres actually intended for marketing. As such, it is comprised of seven quotients (Q), one for each of the seven eligible crops. Each Q is calculated as:

$$Q = \frac{M+S+A(YA-Y)}{YA}$$

where:
M = marketings of the crop in the designated area
S = change in farm stocks in the designated area
A = area seeded to the crop in the designated area
Y = yield of the crop in the designated area
YA = average yield of the crop in the preceding five years.
(Spriggs 1985, 211-212), (Western Grain Stabilization Program Report 1986, Append. B)

The quotients are calculated for each of the seven crops in each of the three provinces and area-wide, and a *Marketing Production Ratio* is calculated for the crop years 1965/66 to 1986/87.

Because data for farm stocks of grain in B.C. are available for only the crop years 1982/83 to 1986/87, and for only three of the seven eligible grains: wheat, oats, and barley, a *MPR* for B.C. must be calculated indirectly.

It is observed that the *MPR* for each crop is quite similar across the other three provinces - Manitoba, Saskatchewan, and Alberta; i.e. the MPR for wheat ranges between .80 to .90; for barley it ranges between .50 to .60, and so on. It was decided therefore to calculate *MPR* values for B.C. for each of the crop years from 1965/66 to 1986/87 by using the average value across the other three provinces of each individual crop's *MPR* and apply each one to the corresponding crop in B.C. This average value of *MPR* for each crop is then divided by B.C.'s hectares for that particular crop thereby estimating the quotient value for each crop. The quotients for all of the seven crops are then summed together and divided by the total number of hectares for the eligible crops in the Peace River district, resulting in a measure for the *MPR* for each year.

4. Eligibility Ratio (ER)

The *Eligibility Ratio (ER)* is comprised of two components:

$$Part\ I = \frac{Total\ Eligible\ Sales\ of\ Actual\ Producers}{Total\ Gross\ Sales\ of\ Actual\ Producers}$$

$$Part\ II = \frac{Total\ Eligible\ Sales\ of\ Actual\ Producers}{Total\ Gross\ Sales\ of\ All\ Producers}$$

or:

$$ER = \frac{Total\ Eligible\ Sales\ of\ Actual\ Producers}{Total\ Gross\ Sales\ of\ All\ Producers}$$

This ratio adjusts *Net Cash Flow* to reflect two of the WGSP's objectives:

1) Covering 90 percent of commercial grain sales. In accordance with this objective, producers can only contribute levies on gross sales up to a specified amount - hence these sales are defined as *eligible* sales. The eligible limit is $60,000.

2) The WGSP distinguishes between *all* and *actual* producers - attempting to include only actual producers in the plan. *All* producers is defined as all producers including *landlords operating under share rent agreements, non-citizens, and corporations less than 50% Canadian-owned* (Western Grain Stabilization Program Report 1986, 2).

Calculations for the *ER* are derived directly from the WGSP's annual reports for the crop years 1983/84 to 1986/87. To begin, *actual* producers must be distinguished from *all* producers, and the best way to demonstrate how this is done is by way of example.

In table 7 of Appendix A, Exhibit F of the 1986/87 annual report is shown. At each level of annual grain receipts, the *actual* number of producers is calculated for each province by multiplying the ratio of $\frac{\text{The Number of Actual Producers}}{\text{The Number of Participants}}$ to the number of participants for each province. The total eligible sales of *actual* producers is then found by summing the number of *actual* producers with sales up to and including $60,000.

The denominator, *Total Gross Sales of All Producers* is calculated by dividing total gross sales of *actual* producers by .92, which converts *actual* to *all* producers. The value .92 is used because it was observed from the WGSP annual reports that historically, *actual* producers have accounted for 92 percent of *all* producers on a consistent basis.

Calculating the *Eligibility Ratios* in this manner requires that two assumptions be made. Firstly, that the percentage of *actual* producers to *all* producers is the same across all of the provinces (i.e. 92%). And secondly, that the proportion of annual grain receipt levels is the same for *actual* producers and participants.

This method is used for both the current and the proposed plan for the crop years 1983/84 to 1986/87. For the years prior to 1983/84 however, WGSP data can not be used as it has been collected and calculated on a calendar year basis. OLS regression are therefore calculated, regressing the calculated *Eligibility Ratios* against *Gross Grain Receipts*. The following equations were derived for each province:

Table V.1

OLS Estimated Eligibility Ratios by Province	
Manitoba	ER = 97.633 - .22854E-04 x Gross Grain Receipts (117.89) (26.12) T Ratios in Brackets R^2=99, n=4
Saskatchewan	ER = 103.23 - .97752E-05 x Gross Grain Receipts (99.53) (25.04) R^2=99, n=4
Alberta	ER = 98.237 - .11987E-04 x Gross Grain Receipts (123.69) (22.69) R^2=99, n=4
B.C.	ER = 93.696 - .15435E-03 x Gross Grain Receipts (38.29) (3.56) R^2=79, n=4
Area-Wide	ER = 100.07 - .42709E-05 x Gross Grain Receipts (139.37) (30.62) R^2=99, n=4

From these equations, values for the *Eligibility Ratio* is calculated for each province and area-wide for the crop years 1971/72 to 1982/83.

5. Weighted Participation Ratio (WPR)

This ratio is used to adjust *Potential Payout* to reflect the fact that not all eligible producers participate in the WGSP. The first step in calculating this ratio is to measure the *Participation Ratio (PR)*:

$$PR = \frac{\text{Total Eligible Sales of Participants}}{\text{Total Eligible Sales of All Producers}}$$

The *Participation Ratio* is calculated in much the same manner that is used in calculating the *Eligibility Ratio*. Exhibit F from the WGSP's annual reports are again used, and the proportion of *actual* participants is again calculated as it was for the *Eligibility Ratio*, but only for the eligible levels of grain receipts. The ratio is then calculated directly for each province and area-wide for the crop years 1983/84 to 1986/87. Again, OLS regressions, regressing the *Participation Ratio* against *Gross Grain Receipts*, are calculated and used to measure the *Participation Ratios* for the crop years 1971/72 to 1982/83. The OLS regressions are:

Table V.2

OLS Estimated Participation Ratios by Province	
Manitoba	PR = 72.608 + .53546E-05 x Gross Grain Receipts (313.54) (23.53) T Ratio in brackets R^2=99, n=4
Saskatchewan	PR = 91.831 - .48742E-05 x Gross Grain Receipts (34.20) (4.82) R^2=92, n=4
Alberta	PR = 87.400 - .57106E-05 x Gross Grain Receipts (23.72) (2.33) R^2=73, n=4
B.C.	PR = 82.975 - .75854E-04 x Gross Grain Receipts (38.97) (2.01) R^2=67, n=4
Area-Wide	PR = 91.91 - .25343E-05 x Gross Grain Receipts (69.88) (9.92) R^2=98, n=4

With measures of the *Production Ratio* made, the *Weighted Participation Ratio (WPR)* is then calculated:

$$WPR = \frac{(PR_{(t-3)} \times NCF_{(t-3)}) + (PR_{(t-2)} \times NCF_{(t-2)}) + (PR_t \times NCF_t)}{(NCF_{(t-3)} + NCF_{(t-2)} + NCF_t)}$$

B. A Comparison of Payout Calculations

With the variables that are used in both of the cash flow calculations, net cash flow and per unit net cash flow, measured by province and for the aggregate CWB designated area, stabilization payments calculated under the proposed plan are compared with historical WGSP payouts. The crop years 1983/84 to 1986/87 are used for comparison. Comparisons for years prior to 1983/84 cannot be made because the WGSP cash flow calculations for these years are based on calendar years.

In table V.3 below, the actual WGSP stabilization payouts are compared to the area-wide payouts calculated using the cash flow variables generated for the proposed plan. The figures verify that the historical cash flow data generated for the proposed plan compare very closely to the methodology and data used by the WGSP.

Table V.3

A Comparison of Stabilization Payments
Proposed and WGSP Program for Area-Wide Payouts
($millions)

Crop Year	WGSP Payments	Proposed Plan Payments
1983/84	$223	$224
1984/85	522	467
1985/86	859	1,004
1986/87	1,398	1,320
TOTAL	$3,002	$3,015

Source: WGSP Payments - Western Grain Stabilization Annual Reports, 1983/84 to 1986/87. Proposed Plan Payments estimated.

It was expected that the difference between payouts under the two plans would be larger than these calculations show because the individual cash flow calculations were anticipated to reflect the marketing and production characteristics of each province. However, the forecasts made for each province may reveal greater differences between the plans.

The Stabilization Account Balance

The Stabilization Account is comprised of the yearly balances of the producer and government levies, interest debits or credits, less producer payouts. This account must be calculated historically by province and area-wide so that each province has a separate opening balance for the simulation of the proposed and current plans.

Historical yearly account balances for each province and area-wide, for the years 1976 to 1986/87, are derived directly from the WGSP annual reports by using the actual payouts to the provinces; applying the historical rates at which levies had been paid on grain receipts and applying this rate to the grain receipts for each province; and using the actual rate of interest debited/credited to the account each year and applying it directly to each province's account. The resulting separate Stabilization Accounts may be seen in tables 8.a to 8.c in Appendix A.

C. Stochastic Simulation

With the historical data for both the cash flow calculations and the Stabilization Account established for each of the five separate accounts, the second step in the model is to use the process of stochastic simulation to simulate the proposed and the WGS programs. The programs are simulated over a five year period, and then evaluated and compared based on the basis of size and stability of net cash flow, and the actuarial soundness of the program.

In the cash flow calculations, the variables price, marketings, and expenses are considered to be random. The other cash flow variables, such as the Eligibility and Marketing Production Ratios, remain fixed from year to year. The random variables "drive" the calculations; it is their variability that triggers payouts, determines levys, and ultimately the stabilization account balance. Because of this, the forecasted program changes centre on these variables.

Regressions are calculated for each of the random variables, using the data gathered for each of the separate accounts for 1960 to 1986/87. These measures, along with ten year averages of the other (non-dynamic) cash flow variables, are then incorporated in the stochastic simulation model which generates five year forecasts.

Stochastic simulation was used by Spriggs in both his 1985 and 1988 economic analysis of the WGSP. This method of analysis was chosen because it specifically takes into account the random and dynamic characteristics of the model. Randomness is caused by the estimated parameters, and by the additive error of each equation (Pindyck and Rubinfeld 1981, 383). Stochastic simulation incorporates the characteristics of the WGSP's cash flow calculations:

> 1.The program is dynamic in that payments and levies are based on moving averages of past data.
>
> 2. The program operates on the basis of fluctuations in random variables (e.g. prices, marketings and expenses.)
>
> 3. The program makes use of trigger mechanisms for payouts and levies which introduces discontinuities into the functional relationships (Spriggs 1985, 217).

The general procedure for stochastic simulation is as follows: for each simulation period, a distribution is specified for the additive error term and the estimated coefficient of each equation in the model. Distributions are specified for both the additive error term and the coefficient since both are sources of randomness in linear regressions. A specified number of random numbers, i.e. 200, are then generated based upon these distributions and used to construct a forecast equation for each period. For simulations greater than one period, the same distributions for the estimated coefficients is used in each simulation period since it is assumed that the coefficients are constant over time. However, new probability distributions are generated for the additive error term for each simulation period.

The specific process of the stochastic simulation model used in this study is as outlined below:

1. Regression Estimates

Each of the three random variables: *price*, *marketing*, and *expenses* are regressed against a trend value. Twenty-six years of data are used in each regression, so the trend value begins at one and ends at twenty-six.

2. Simulation of the Additive Error Term

For each regression estimate, in each of the five simulation periods, 200 random numbers are generated based upon the distribution of the standard error of the regression. The distributions are assumed to be normal with 0 mean and standard deviation equal to the standard error of the regression.

3. Simulation of the Coefficient

For each regression estimate, over the entire simulation period of five years, 200 random numbers are generated based on the probability distributions of the estimated coefficients. The coefficient's distributions are assumed to be normally distributed with mean equal to the estimated value, and standard deviation equal to the standard error of the coefficient.

4. Simulation of the Forecast Equation

Forecast equations are generated for each the random variables; *price*, *marketing* and *expenses*, for each year of the five year forecast. It incorporates the 200 randomly generated values for the coefficient (step 3), and the 200 random values of the additive error term that were generated for each of the five forecast periods.

$\hat{Y}_{(rT)} = \bar{Y} + \mathbf{B}_r (X_{(T)} - \bar{X}) + u_{(rT)}$, *where*
$\bar{Y}$ = *mean of the dependent variable*
$\mathbf{B}$ = *simulated coefficient*
u = *simulated additive error term*
T = *simulation period*; 1...5
r = *random numbers*; 1...200,*and*
X = *the independent parameter, trend*

To illustrate the process used in steps 1 through to 4, and how the forecast equation is used, the estimate for Saskatchewan's *marketing* is used as an example:

- Step 1, the regression estimate is:

$YM = 7{,}791 + 346X$, *where:*
standard error of the coefficient = 49.519
standard error of the regression = 2,004
$\bar{Y} = 12{,}639$

- In step 2, the simulation of the additive error term, 200 numbers are randomly generated for each forecast period, using 2,004 as the standard deviation and 0 mean.

- Step 3 generates 200 random values of the coefficient, using a mean of 346 and the error of 49.519 as the standard deviation.

- In step 4, for the first forecast period, *marketing* $(\hat{Y}_{(rT)})$ is estimated from:

12,639 + 200 *coefficient simulations* x (27 - 13.5)
+ 200 *additive error term simulations*

This process is replicated for each of the five forecast periods, but with new values for the trend variable $X_{(T)}$, and the additive error term $u_{(rT)}$, in each period.

5. Simulation of the Cash Flow Calculations and Stabilization Account

The variables calculated from each forecast equation and ten year averages of the non-random variables are used in estimating the two cash flow calculations for each forecast period. For example, *gross grain receipts* is the product of the estimated $\hat{Y}_{(rT)}$'s for *marketing* and *price*; *net grain expenses* is calculated as the estimated $\hat{Y}_{(rT)}$ for *expenses* x the ten year average of the marketing production ratio, and so on.

The payouts (200 for each forecast period) calculated from the simulated net cash flow calculations are carried into the stabilization account and values calculated for producer and government levys, interest, and year-end balance. The proposed plan is then evaluated and compared to the current plan using the aforementioned criteria as the basis for comparison.

6. Comparison of Provincial and Area-Wide Forecasts

The variables, *levys*, *payouts*, and *stabilization account balance*, generated in the separate provincial accounts, are compared to those generated in the area-wide account. The following equation compares provincial calculations to the provinces' share of payouts, levys etc. under area-wide calculations:

$$PVar_{(rT)} = Avar_{(rT)} * \frac{GGRp_{(rt)}}{GGRa_{(rT)}}$$

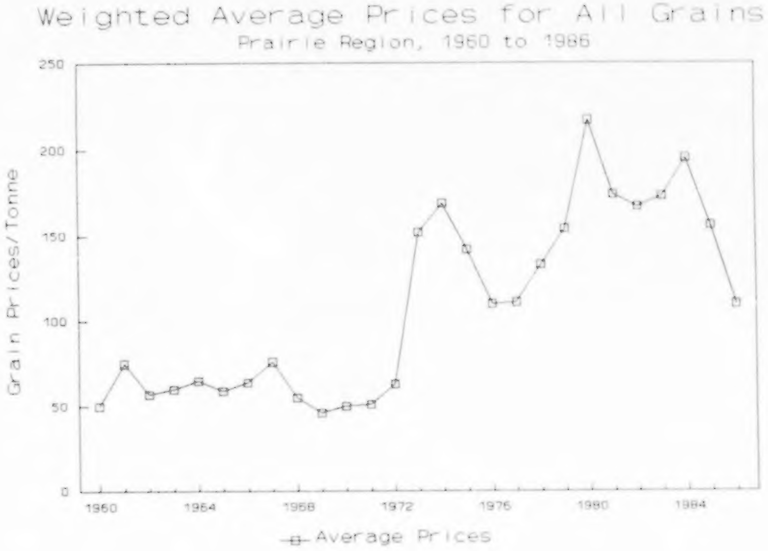
where: $PVar$ = Variable estimated by province
$Avar$ = Variables estimated area-wide
$GGRp$ = Gross Grain Receipts estimated by province
$GGRa$ = Gross Grain Receipts estimated area-wide
r = random number; 1....200
T = simulation period; 1....5

The regression estimates are now discussed in more detail.

Regression Estimates of Price, Marketing and Expenses

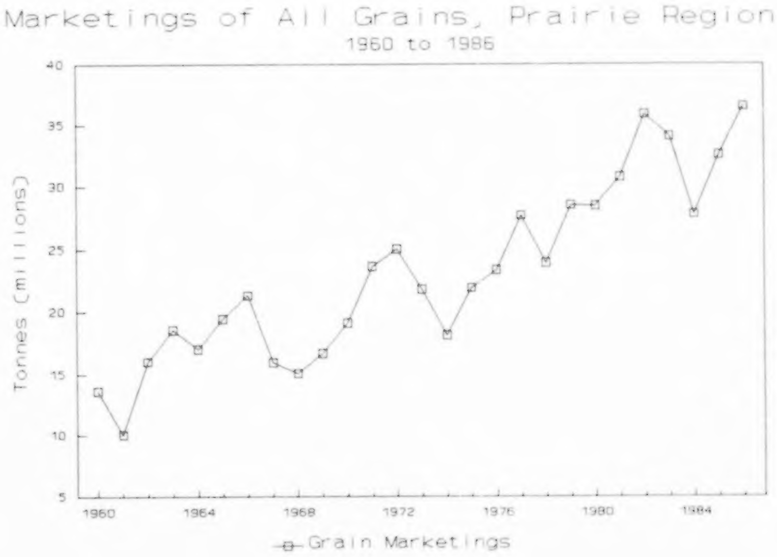
The regressions for the variables *price*, *expenses*, and *marketing* are based on historical data for the time period of 1960/61 to 1986/87 (crop years). In figures 1 and 2 on the following page, the upward linear trend of *price* and *marketing* can be seen. The trend for *expenses* (figure 3), however, is seen to be curvilinear and is therefore indexed to the Consumer Price Index (CPI) where 1981 = 100, figure 4.

Figure V.1



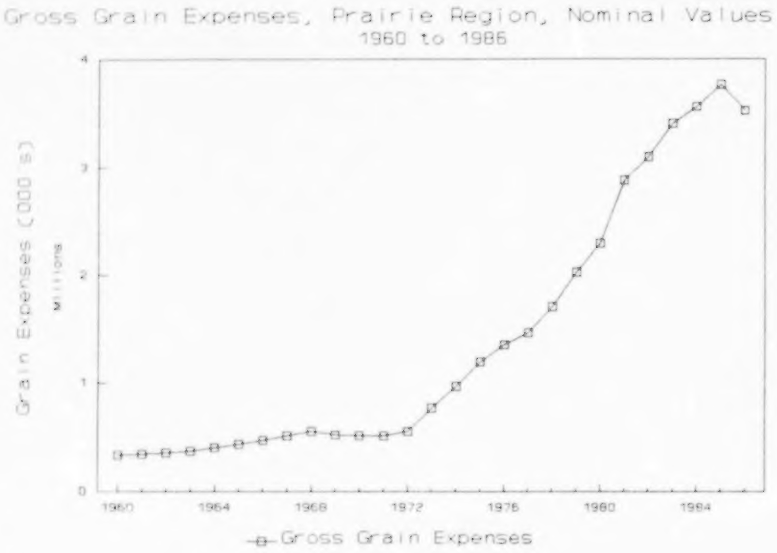
Source: Statistics Canada.

Figure V.2



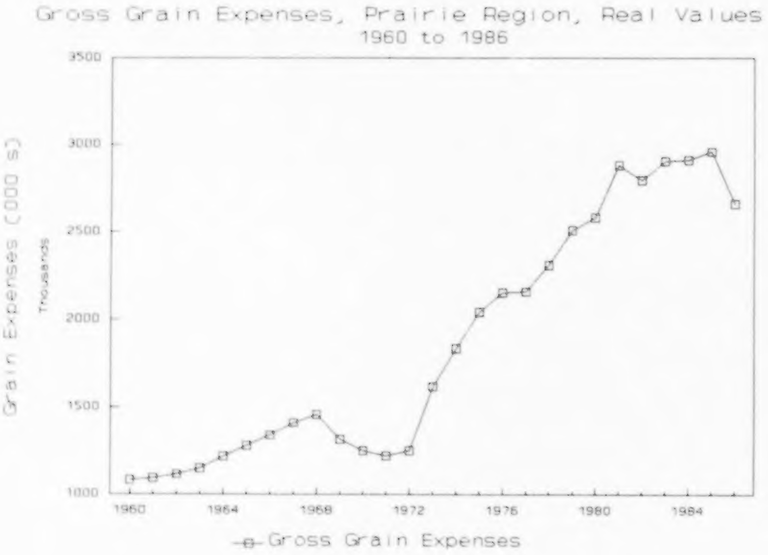
Source: Statistics Canada.

Figure V.3



Source: Statistics Canada.

Figure V.4



Source: Statistics Canada.

Using OLS regressions where, $Y = \alpha + \beta(trend) + u_t$, it was found that autocorrelation was present in the measures for price and expenses. Autocorrelation is often present when time-series models are used. Changes in variables over time may not always be instantaneous, but instead be influenced in some way by past values.

In a dynamic model, the influence of past values may be reflected by one or more of three ways: the dependent variable may depend upon lagged values of itself; the independent variable may contain lagged values; or the error term may be influenced by lagged values of itself (autocorrelation) (Judge 1982, 434).

With the time-series models used in this study, where the dynamic variables price, marketing, and expenses, are regressed on a trend value, it is not unexpected that a dynamic process where the residuals are correlated between time periods will be exhibited. None of these variables are likely to be generated by completely random processes; rather they are more likely to exhibit a sequential time process. For example, it would be expected that a large change in price at a given point in time would also be reflected in subsequent time periods. And similarly, it is likely that current expenses and marketings would also reflect prior "shocks".

To incorporate the additional information of autocorrelation into the model specification and thereby increase the efficiency of the estimate, an autoregressive model is used. For a two variable model, the autoregressive model may be specified as:

$$Y_t = X\mathbf{B}_t + e_t, \text{ where}$$
$$e_t = \rho e_{(t-1)} + v_t, \text{ and}$$

$$\rho \text{ is the autocorrelation coefficient,}$$
$$v_t \text{ is the random disturbance term,}$$
$$\text{and } -1 < \rho < 1$$

The specification for this equation is for a first-order autoregressive process, or AR(1), where the error term, e_t , is dependent upon values of itself from the previous time period, $e_{(t-1)}$, and upon the random disturbance term, v .

For some autocorrelation structures, e_t may be dependent upon lagged values of itself from more than one period. It may depend for example, upon lags from three previous time periods, or an AR(3) process. The presence of first-order autocorrelation is easily determined by using the Durbin-Watson test statistic. However, higher-order autocorrelation structures are not identified by the Durbin-Watson test and therefore an alternative testing procedure, discussed by Koutsoyiannis (1977, 217), is used to determine the autocorrelation structure in the price and marketing estimations for this study.

Using this testing procedure, it was found that the two variables, price and expenses had autocorrelation structures of either first or second orders, depending upon the province for which the regression was calculated.

A second-order autoregressive process is expressed as: $e_t=\rho_1 e_{t-1}+\rho_2 e_{t-2}+v_t$ With this process, the error term is influenced by lags from both the first and second lag periods and by the random disturbance term, v_t .

The econometric computer program, Shazam (1988), was used to estimate autoregressive models for price and expenses, and OLS regressions for marketing. Shazam's autoregressive process uses a modified Cochrane-Orcutt procedure developed by Beach and MacKinnon (1978a).

The second-order autoregressions were also estimated with Shazam, which uses the FML approach of Beach and MacKinnon (1978b).

Table V.4 on the following pages show the regressions for each of the dynamic variables, calculated area-wide and for each of the four provinces. For each regression, the number of observations equals 27 and an ascending trend value is used as the independent parameter. Below each regression equation, the standard error of the coefficients are shown in brackets and the t-ratios underneath.

Following the regression equations are the values for: R^2 ; the standard error of the regression (S); t test; and the mean of the dependent parameter.

The t test is used to test whether the independent variable, trend, is statistically significant in the regression equation; or, $H_o: B=0$, $H_a: B\neq0$. Using a two-tailed test at a 95 percent confidence level, with 24 degrees freedom, the critical value is 2.064.

Therefore, when the computed t values are greater than 2.064, the coefficient is statistically significant and the $H_o: B=0$ is not accepted (Johnson 1984, 176).

Table V.4

Regression Estimates for Price, Expenses and Marketing		
Price	**Expenses**	**Marketing**
AREA-WIDE		
(2nd Order AutoRegression) YP = 32 + 5X (15.928) (.996) 2.005 5.384 $R^2 = .79$ $\underline{S} = 25.137$ $\overline{P} = 108.67$ t test: H_o not acc.	(1st Order AutoRegression) YE = 915,850 + 68,142X (214,010) (13,469) 3.800 5.059 $R^2 = .96$ $\underline{S} = 130{,}880$ $\overline{E} = 1{,}869{,}500$ t test: H_o not acc.	(OLS) YM = 11,734 + 810X (1,183) (73,861) 9.916 10.965 $R^2 = .83$ $\underline{S} = 2{,}989$ $\overline{M} = 23{,}075$ t test: H_o not acc.
MANITOBA		
(2nd Order AutoRegression) YP = 34 + 5X (15.448) .966) 2.197 5.434 $R^2 = .80$ $\underline{S} = 23.703$ $\overline{P} = 108.85$ t test: H_o not acc.	(1st Order AutoRegression) YE = 164,050 + 15,588X (59,155) (3,262) 2.773 4.778 $R^2 = .97$ $\underline{S} = 30{,}195$ $\overline{E} = 381{,}830$ t test: H_o not acc.	(OLS) YM = 1,270 + 164X (281.21) (17,553) 4.518 9.324 $R^2 = .77$ $\underline{S} = 710.40$ $\overline{M} = 3{,}562$ t test: H_o not acc.
SASKATCHEWAN		
(1st Order AutoRegression) YP = 36 + 5X (22.901) (1.399) 1.577 3.803 $R^2 = .77$ $\underline{S} = 29.008$ $\overline{P} = 112.30$ t test: H_o not acc.	(1st Order AutoRegression) YE = 373,910 + 28,484X (102,910) (5,463) 3,633 5.214 $R^2 = .97$ $\underline{S} = 45{,}321$ $\overline{E} = 747{,}210$ t test: H_o not acc.	(OLS) YM = 7,791 + 346X (793.34) (49.519) 9.820 6.993 $R^2 = .66$ $\underline{S} = 2{,}004.2$ $\overline{M} = 12{,}639$ t test: H_o not acc.
ALBERTA		
(2nd Order AutoRegression) YP = 35 + 5X (14.385) (.901) 2.4 5.401 $R^2 = .80$ $\underline{S} = 22.409$ $\overline{P} = 104.44$ t test: H_o not acc. Durbin-Watson test: calc.= 1.872 t test: H_o not rjcted	(2nd Order AutoRegression) YE = 355,820 + 25,074X (71,900) (4,398) 4.950 5.701 $R^2 = .95$ $\underline{S} = 57{,}371$ $\overline{E} = 719{,}100$ t test: H_o not acc. Durbin-Watson test: calc. = 1.872 t test: H_o not rjcted	(OLS) YM = 2,561 + 296X (630.08) (38.755) 4.06 7.644 $R^2 = .87$ $\underline{S} = 937$ $\overline{M} = 6{,}652$ t test: H_o not acc.
B.C.		
(1st Order AutoRegression) YP = 32 + 4X (25.644) (38.755) 4.06 5.701 $R^2 = .83$ $\underline{S} = 21.699$ $\overline{P} = 96.185$ t test: H_o not acc.	(2nd Order AutoRegression) YE = 5,392 + 1,106X (2,581) (161.94) 2.089 6.829 $R^2 = .93$ $\underline{S} = 2{,}801$ $\overline{E} = 21{,}388$ t test: H_o not acc.	(OLS) YM = 95 + 9X (21.874) (1.365) 4.342 6.663 $R^2 = .64$ $\underline{S} = 55.259$ $\overline{M} = 222.33$ t test: H_o not acc.

As outlined in steps two to four of the modelling process, the coefficient and the random error of each variable are simulated using the regression estimates. These values are inputs to the forecast equations, which generates forecast values each year for a five year period.

Regression and Simulation Results

In table V.5 on the following page, the historical and forecast estimates for the random variables, price, expenses, and marketings are shown. The forecast values are the estimated means for the crop years 1987/88 to 1991/92, and are based on 200 replicates of the forecast equations. For convenience, only historical data for 1975/76 to 1985/86 is shown.

The forecast of the variables, based as they are on the regression estimates and an ascending trend value, display an upward trend over the five year forecast period. As such, they tend to mimic some of the historical patterns; i.e. from 1978 to 1980, all the random variables displayed the same upward trend.

Table V.5

Prices, Expenses, & Marketings For the Prairie Region, 1975 to 1992
Historical & Forecast Values

	Area-Wide			Manitoba			Saskatchewan			Alberta			B.C.		
Year	P ($/ton)	E ($000's)	M Tons (000's)	P ($/ton)	E ($000's)	M Tons (000's)	P ($/ton)	E ($000's)	M Tons (000's)	P ($/ton)	E ($000's)	M Tons (000's)	P ($/ton)	E ($000's)	M Tons (000's)
1975	142	1,194,766	21,937	143	240,740	3,132	147	452,784	12,032	132	487,969	6,579	118	13,274	193
1976	110	1,354,694	23,370	108	272,831	3,487	112	520,793	12,379	107	545,950	7,261	95	15,121	243
1977	111	1,466,171	27,698	109	305,423	4,565	111	570,017	15,967	113	572,899	6,994	144	17,832	173
1978	133	1,708,758	23,919	133	374,648	3,846	135	677,532	13,033	129	636,399	6,886	136	20,179	153
1979	154	2,026,088	28,535	159	459,651	4,350	155	803,790	15,088	148	736,409	8,823	162	26,238	273
1980	217	2,295,058	28,469	216	499,888	3,515	236	901,897	14,549	190	861,938	10,087	188	31,335	318
1981	174	2,880,068	30,743	169	615,818	4,917	183	1,104,696	15,160	164	1,126,972	10,388	157	32,583	277
1982	167	3,097,453	35,865	166	657,037	5,724	172	1,226,864	19,144	158	1,171,980	10,705	154	41,572	291
1983	173	3,403,354	34,065	179	707,630	4,904	178	1,386,137	17,461	162	1,262,536	11,228	162	47,051	472
1984	195	3,559,896	27,793	184	753,606	5,485	202	1,446,065	13,477	190	1,311,514	8,483	175	48,712	347
1986	156	3,761,892	32,531	147	798,342	7,784	165	1,564,769	15,765	150	1,359,509	8,679	140	39,272	304
1987	110	3,524,057	36,490	117	749,221	5,893	134	1,538,352	18,395	101	1,206,707	11,826	100	29,778	376
1988	186	2,985,800	34,903	187	635,730	5,955	188	1,209,000	17,578	176	1,121,300	10,886	162	39,698	352
1989	191	3,069,800	35,582	194	652,190	6,147	196	1,243,500	18,194	180	1,145,000	11,209	164	40,754	367
1990	192	3,134,300	36,023	196	671,820	6,230	203	1,267,300	18,461	184	1,179,400	11,447	167	41,802	366
1991	202	3,218,000	37,174	202	685,150	6,345	203	1,305,100	18,480	190	1,202,000	11,824	175	42,832	378
1992	207	3,279,600	38,355	209	702,070	6,521	211	1,328,700	18,519	195	1,232,200	12,247	180	44,034	390

Source: Historical Data - Statistics Canada; Dominion Bureau of Statistics. Forecasts estimated.

With values for each of the three random variables simulated for each year of the five year forecast, the two cash flows - net cash flow and per unit net cash flow, are calculated for the proposed and the WGS programs. Table V.6 below displays the results of the cash flow calculations that would accrue to producers in each province from these simulations.

Table V.6

Summation of Producers Cash Flow
(Forecast Periods 1987/88 to 1991/92)

	PROPOSED PLAN (000's)			CURRENT PLAN (000's)		
Province	(Net Cash Flow + Payouts - Producer Levys)	Standard Deviation	Coefficient of Variation	(Net Cash Flow + Payouts - Producer Levys)	Standard Deviation	Coefficient of Variation
Manitoba	$2,823,800	556,920	20%	$2,808,200	555,250	20%
Saskatchewan	$9,879,800	2,127,100	21%	$9,892,600	2,127.600	21%
Alberta	$5,046,100	955,900	19%	$5,034,100	953,790	19%
B.C.	$141,730	49,603	35%	$141,170	49,313	35%
TOTAL	$17,891,430	3,689,523	19%	$17,876,070	3,685,953	20%

The stabilization account balance is also simulated for each of the forecast years based on the calculated values for levys, interest, debits or credits, payouts and the beginning fund balances. In terms of calculating levy charges for this account, among the amendments made to the WGSA with the passing of Bill C-132 in July, 1988, were increases in producer and government levies. Prior to the amendment, producer levies ranged from one to two percent depending upon the Stabilization Account balance, with government levies equal to producer levies plus two percent. Bill C-132 increased levies and provided the following basis for their estimation:

> Levy for 1987/88 and 1988/89 crop years: Producer levies set at four percent of gross grain receipts. Government levies set at six percent.
>
> Levy for subsequent crop years:
> (a) four per cent where, before July 1 of the immediately preceding year, the Minister estimates that there will be a deficit in the Stabilization Account on July 31 of that preceding year;
>
> (b) three per cent where, before July 1 of the immediately preceding year, the Minister estimates that there will be an amount standing to the credit of the Stabilization Account on July 31 of that preceding year; or
>
> (c) two per cent where, before July 1 of the immediately preceding year, the Minister estimates that the balance in the Stabilization Account on July 31 of the preceding year will exceed fifty per cent of the average annual aggregate net grain sale proceeds, for the five year period ending on July 31 of that preceding year (Bill C-132, 14).

For the purpose of this study, Bill C-132's flat rate of four percent for the crop years 1987/88 - 1988/89 is ignored and the process of estimating levies described in steps (a), (b) and (c) above is used for the entire simulation period.

Bill C-132 also changed the rate at which interest charges are credited or debited to the account. Previously, interest was calculated as ninety percent of ninety-day treasury bills. With the amendments however, the amount of interest which the account is debited or credited is made at the discretion of the Minister of Finance (Bill C-132, p21). Therefore, it was decided to use an arbitrary rate of eleven percent per cent on any debit or credit charges to the Stabilization Account. Tables V.7 to V.10 on the following pages show the historical and forecast account.

Table V.7

Manitoba Actual and Estimated Value of WGSP Stabilization Account ($ millions)											
	Year	Producer Levy		Government Levy		Interest		Payout		Ending Balance	
HISTORICAL	1976	4.00		8.00		0.21		0		12.21	
	1977	4.20		8.40		1.12		0		25.93	
	1978	5.10		10.20		1.93		17.87		25.28	
	1979	7.30		14.60		1.56		41.40		7.35	
	1980	8.00		16.00		1.65		0		33.00	
	1981	8.90		17.80		7.44		0		67.14	
	1982	9.10		18.20		9.96		0		104.40	
	1983	10.90		21.80		10.07		0		147.16	
	1984	4.20		9.79		8.69		36.13		133.72	
	1984/85	8.30		19.37		12.83		87.78		86.45	
	1985/86	6.00		18.00		6.22		150.80		-34.13	
	1986/87	4.80		14.40		-3.21		260.11		-278.25	
FORECAST		New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan
	1987/88	18.89	21.83	28.47	32.74	-25.39	-23.51	0	0	-256.19	-237.27
	1988/89	20.27	23.31	30.41	34.97	-22.61	-19.70	0	0	-228.11	-198.75
	1989/90	20.84	23.97	31.26	35.96	-19.36	-15.34	0	0	-195.36	-154.85
	1990/91	21.80	25.07	32.71	37.62	-15.49	-9.49	0	0	-156.34	-95.85
	1991/92	23.17	26.54	34.75	39.81	-10.83	-2.96	0	0	-109.25	-29.87
	TOTAL	105.06	120.72	157.6	181.10	-93.68	-70.99	0	0	N/A	N/A

Source: Historical Data - Western Grain Stabilization Annual Reports (1976 - 1986/87). Forecast data estimated

Table V.8

Saskatchewan
Actual and Estimated Value of WGSP Stabilization Account
($ millions)

	Year	Producer Levy		Government Levy		Interest		Payout		Ending Balance	
HISTORICAL	1976	14.70		29.40		0.77		0		44.87	
	1977	16.70		33.40		4.27		0		99.25	
	1978	16.60		33.20		6.96		69.09		86.91	
	1979	25.30		50.60		5.40		150.33		17.88	
	1980	27.60		55.20		5.30		0		105.98	
	1981	31.80		63.60		25.09		0		226.48	
	1982	31.40		62.80		33.81		0		354.49	
	1983	36.80		73.60		34.14		0		499.03	
	1984	16.00		37.31		29.78		125.94		456.18	
	1984/85	24.60		57.42		42.78		292.36		288.62	
	1985/86	16.30		48.90		19.93		477.14		-103.10	
	1986/87	15.00		45.00		-9.33		759.24		-811.96	
FORECAST		New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan
	1987/88	67.30	64.92	100.96	97.38	-70.81	-69.61	0	0	-714.52	-702.46
	1988/89	72.48	69.91	108.72	104.87	-58.66	-59.39	0	0	-591.98	-599.36
	1989/90	76.05	73.36	114.08	110.04	-44.20	-47.26	0	0	-446.04	-476.98
	1990/91	76.27	73.57	114.41	110.36	-28.09	-27.63	0	0	-283.45	-278.78
	1991/92	80.21	77.67	120.32	116.51	-9.12	-8.61	0	0	-92.03	-86.89
	TOTAL	372.31	359.44	558.49	539.16	-210.88	-212.49	0	0	N/A	N/A

Source: Historical data - Western Grain Stabilization Report (1976 to 1986/87). Forecast data estimated

Table V.9

Alberta
Actual and Estimated Values of WGSP Stabilization Account
($ millions)

	Year	Producer Levy		Government Levy		Interest		Payout		Ending Balance	
HISTORICAL	1976	5.50		11.00		0.29		0		16.79	
	1977	6.90		13.80		1.69		0		39.18	
	1978	6.60		13.20		2.75		27.28		34.45	
	1979	10.60		21.20		2.20		59.53		8.93	
	1980	12.30		24.60		2.41		0		48.24	
	1981	15.30		30.60		11.73		0		105.87	
	1982	14.70		29.40		15.83		0		165.78	
	1983	17.10		34.20		15.94		0		233.02	
	1984	6.30		14.69		13.70		59.34		208.37	
	1984/85	12.30		28.71		19.82		138.32		130.89	
	1985/86	7.40		22.20		9.04		225.44		-55.91	
	1986/87	7.40		22.20		-5.66		368.04		-400.00	
FORECST		New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan
	1987/88	35.42	37.552	53.13	56.33	-34.26	-40.35	0	0	-345.70	-407.13
	1988/89	37.25	39.49	55.88	59.23	-27.78	-33.50	0	0	-280.35	-338.03
	1989/90	38.80	41.13	58.19	61.69	-20.17	-26.39	0	0	-203.53	-266.34
	1990/91	41.38	43.86	62.07	65.80	-11.01	-16.51	0	0	-111.10	-166.62
	1991/92	43.87	46.73	65.81	70.10	-.15	-5.08	0	0	-1.57	-51.30
	TOTAL	196.72	208.76	295.08	313.15	-93.37	-121.82	0	0	N/A	N/A

Source: Historical Data - Western Grain Stabilization Report (1976 to 1986/87). Forecast data estimated

Table V.10

B.C. Actual and Estimated Value of WGSP Stabilization Account ($ millions)											
	Year	Producer Levy		Government Levy		Interest		Payout		Ending Balance	
HISTORICAL	1976	.10		.20		0.01		0		.31	
	1977	.20		.40		.04		0		.95	
	1978	.20		.40		.07		.72		.90	
	1979	.30		.60		.06		1.69		.16	
	1980	.40		.80		.07		0		1.43	
	1981	.40		.80		.33		0		2.96	
	1982	.30		.60		.41		0		4.27	
	1983	.40		.80		.40		0		5.87	
	1984	.15		.35		.34		1.51		5.21	
	1984/85	.30		.70		.49		3.37		3.32	
	1985/86	.20		.60		.23		5.36		-1.00	
	1986/87	.20		.60		-.04		8.09		-8.33	
FORECAST		New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan	New Plan	Old Plan
	1987/88	1.09	1.18	1.63	1.68	-.62	-1.21	0	0	-6.22	-12.22
	1988/89	1.15	1.18	1.72	1.77	-.37	-.99	0	0	-3.71	-10.01
	1989/90	1.16	1.20	1.74	1.80	-.09	-.77	0	0	-.90	-7.77
	1990/91	1.14	1.29	1.71	1.93	.21	-.50	0	0	2.17	-4.93
	1991/92	1.05	1.36	1.57	2.05	.53	-.15	0	0	5.31	-1.52
	TOTAL	5.59	6.21	8.37	9.23	-.34	-3.61	0	0	N/A	N/A

Source: Historical Data - Western Stabilization Annual Report (1976 - 1986/87). Forecast data estimated

III DISCUSSION OF THE SIMULATION RESULTS

The results are examined in the context of net cash flow - size and stability, and the actuarial soundness of the programs.

From table V.6, it can be seen that producer's cash flow (net cash flow - levys + payouts) would remain virtually unchanged under the proposed program relative to the WGSP. Under the proposed plan, cash flow is marginally higher for Manitoba, Alberta, and B.C.; and marginally lower for Saskatchewan. The estimated means of the alternative program's cash flows were compared using a z test statistic, and found not to be significantly different for any of the provinces (Appendix A).

Likewise, the stability of net cash flow, as measured by the coefficient of variation is the same for the two programs. The proposed program would not offer additional advantages in terms of stabilizing net cash flow.

Some differences between the two programs appear when examining actuarial soundness, as measured by the ending balance in tables V.7 to V.10. Although there is little overall difference between the two plans; the ending balances for all provinces is -\$197.54 million under the proposed program, and -\$169.58 million for the WGSP, some differences appear when examining the program by separate provinces.

The proposed program would have negative impacts on the actuarial soundness of the program in Manitoba; positive impacts in Alberta and B.C.; and very little change in Saskatchewan.

The differences in the actuarial soundness of the two programs is primarily affected by two factors; levy differences combined with the differences in account balances at the beginning of the forecast period.

In Manitoba's stabilization account, table V.7, the ending balances are -\$109.25 million under the proposed plan, and -\$29.87 million under the WGSP. Levys are lower under the proposed program in all of the forecast periods. In the first forecast period, Manitoba's share of the ending balance under the WGSP, calculated as the WGSP ending balance times the ratio of Manitoba's gross grain receipts over area-wide gross grain receipts, is lower than the proposed plan by \$18.92 million. The combination of lower levys, a larger beginning deficit account balance, and higher interest rates, all contribute to a difference of -\$79.38 million in the account balances at the end of the forecast period. In terms of actuarial soundness, Manitoba benefits substantially under the existing plan, and the lower levys under the proposed plan would have to be weighted against this.

The account balances for Alberta at the end of the forecast period are also significantly different between the two programs; -\$51.30 million under the WGSP, and -\$1.57 million under the proposed plan. Like Manitoba, Alberta producers would assume a smaller share of producer levys under the proposed plan. But opposite to Manitoba, Alberta's account balance at the start of the forecast period is smaller than its share of the account balance under the WGSP; resulting in a much reduced account balance at the end of the forecast period.

The proposed changes would have the least impact on Saskatchewan; an ending balance of -$92.03 million under the proposed program and -$86.89 million under the WGSP. It is likely that the difference is small because wheat largely drives the WGSP cash flow calculations, and the proposed program would offer little change for Saskatchewan.

In each case however, the stabilization account balance improved for both the proposed program and the WGSP over the forecast period. Beginning the forecast period with a balance of -$1,602.56 million, by the fifth forecast period, 1991/92, it declined to -$197.54 under the proposed program, and -$169.58 under the WGSP.

VI. SUMMARY AND CONCLUSIONS

A. General Summary

The proposed program of separate provincial payout calculations and stabilization accounts does not achieve the objectives that had been anticipated by such a change. The stability of net income is not increased; producer's net income in each province would remain virtually unchanged; and the actuarial soundness of the provincial programs when taken together, is not greatly different from the original program.

This conclusion is very similar to the one made by Gould et al. (1988), where the authors examined separate accounts by grain. They concluded that net cash flow would be slightly more stable for some of the grains, but overall, little difference exists between the two programs.

A plausible explanation for the similarity between the proposed program and the WGSP may be that prices, marketing, and expenses are likely to be correlated strongly enough over the statutory area to be characterised by the same trends at the provincial levels. Various events, such as droughts for example, are equally as likely to occur in all of the three provinces. In this case, provincial payout calculations would lack sensitivity to the differences in production characteristics that may occur within the provinces.

Other factors which may also have affected the program comparisons could include: provincial expense measures not adequately reflecting production differences between provinces. Although the marketing, production and eligibility ratios do reflect the different marketing and eligibility characteristics between provinces, weighting of production differences in the cash flow calculations may not be significant enough to reflect in the cash flow calculations.

B. Suggestions for Further Study

While it is generally recognized that the WGSP did offer stabilization benefits to its participants, the program's perceived inadequacies led to its demise. Chief among these was the programs insensitivity to the stability of individual producers, and the income transfer component which rendered the program actuarially unsound. However, the account deficits would likely have been reduced sharply by the end of 1991/92, under either a provincial or a regional stabilization plan.

As the problem of income instability is certain to continue in the Prairie farm economy, part of the ongoing challenge will be to find a balance between the area-wide programs and the more individually based ones. Further studies may be directed toward determining the effects of less individually based program structures for GRIP: for example, Saskatchewan's program change from individual to provincial yields; or the effect of changing net revenue calculations from individual grains to grains as a group.

Other aspects of program structures could also be examined. Appropriate responses to world price changes is an example. GRIP was not designed to offset price variability resulting from global trade wars; the effects of removing the programs offsets and changing the indexed moving average price from a fifteen year average in response to this may be a useful issue to study.

The interactive process of participation/stabilization/support could also be examined. Regardless of the type or design of stabilization programs, producer participation has, until now, has been linked to the expected net benefits. Under the WGSP, GRIP, NISA, and crop insurance programs, the level of participation is proportional to the level of benefit the producers expect to extract from the program. Crop insurance in Alberta is an actuarially sound program. However, farmers pay 50 per cent of the premium costs and government pays all administrative costs. It follows then that the areas with the highest yield variability (dryland farming in southern Alberta) have the highest participation rates, while low risk areas have an incentive towards low participation levels. It is improbable that insurance or stabilization schemes with little or no transfer from government would have participation rates high enough to maintain program acceptability.

Much added knowledge seems needed concerning safety-nets using stabilization or insurance programs for farmers. Debate on the basic philosophy and design of safety-nets is important and will surely continue. Research into the effectiveness of present, past and potential price and yield protection programs need to be integrated with a well thought out set of objectives for safety-nets in agriculture.

The use of stochastic simulation to deal with some of these issues may also be a topic for debate and discussion. Part of the issue and concern facing the assessment of stabilization programs may be the ability of these programs to react well to specific types of shocks. Stochastic simulation implies that the shocks are likely to be numerous, random, and consistent with past probability distributions facing these variables. Whether that can safely be assumed in a world in which policy is itself a source of instability may be in itself a topic for reflection and study.

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Table 1.a

AREA-WIDE PAYOUT CALCULATION: USING ORIGINAL TRIGGER

Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Expenses ($000's)	(D) Mrkt./ Prod. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) Elig. Ratio	(H) Net Cash Flow (FxG)	(I) Preced. Five Yr. Ave. NCF	(J) Potential Payout (I-H)	(K) Part. Ratio	(L) Weighted Partic. Ratio	(M) Actual Payout
1960/61	686,212	334,609										
1961/62	754,045	344,286										
1962/63	918,829	356,012										
1963/64	1,121,622	373,460										
1964/65	1,110,796	403,090										
1965/66	1,154,993	434,243	0.662									
1966/67	1,360,246	471,145	0.673									
1967/68	1,219,986	514,284	0.749									
1968/69	835,993	553,321	0.719									
1969/70	767,403	521,775	0.665									
1970/71	962,911	511,132	0.527									
1971/72	1,204,050	514,555	0.632	325,137	878,913	0.9493	834,352			0.8886		
1972/73	1,564,812	551,837	0.616	340,076	1,224,736	0.9339	1,143,781			0.8794	0.8833	
1973/74	3,308,192	770,699	0.668	515,137	2,793,055	0.8594	2,400,351			0.8352	0.8495	
1974/75	3,076,245	970,471	0.734	712,191	2,364,054	0.8693	2,055,072			0.8411	0.8379	
1975/76	3,116,632	1,194,766	0.760	907,434	2,209,198	0.8676	1,916,701			0.8401	0.8406	
1976/77	2,566,681	1,354,694	0.718	972,318	1,594,363	0.8911	1,420,737	1,670,051	249,314	0.8540	0.8460	210,924
1977/78	3,086,304	1,466,171	0.734	1,076,280	2,010,024	0.8689	1,746,510	1,787,328	40,818	0.8409	0.8468	34,564
1978/79	3,178,251	1,708,758	0.736	1,257,539	1,920,712	0.8650	1,661,415	1,907,874	246,459	0.8385	0.8397	206,959
1979/80	4,389,133	2,026,088	0.751	1,521,405	2,867,728	0.8132	2,332,036	1,760,087	(571,949)	0.8078	0.8206	(469,326)
1980/81	6,166,694	2,295,058	0.780	1,790,590	4,376,104	0.7373	3,226,501	1,815,480	(1,411,021)	0.7628	0.7817	(1,102,966)
1981/82	5,362,209	2,880,068	0.795	2,288,950	3,073,259	0.7717	2,371,634	2,077,440	(294,194)	0.7832	0.7714	(226,954)
1982/83	5,974,951	3,097,453	0.770	2,386,100	3,588,851	0.7455	2,675,488	2,267,619	(407,869)	0.7676	0.7749	(316,070)
1983/84	5,888,916	3,403,354	0.774	2,634,560	3,254,356	0.7500	2,440,767	2,453,415	12,648	0.7730	0.7702	9,741
1984/85	5,411,341	3,559,896	0.788	2,804,648	2,606,693	0.7703	2,007,935	2,609,285	601,350	0.7797	0.7760	466,662
1985/86	5,091,068	3,761,892	0.851	3,200,140	1,890,928	0.7809	1,476,626	2,544,465	1,067,839	0.7874	0.7830	836,079
1986/87	4,011,089	3,524,057	0.776	2,733,082	1,278,007	0.8302	1,061,002	2,194,490	1,133,488	0.8191	0.8007	907,532

Source: Historical Data for Receipts & Expenses - Statistics Canada and Dominion Bureau of Statistics.
All other variables estimated

Table 1.b

AREA-WIDE PAYOUT CALCULATION: USING TONNAGE TRIGGER												
Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Expenses (000's)	(D) Market./ Product. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) All Crops Marketing (Tonnes, 000's)	(H) NCF Per Tonne (F/G)	(I) 5 Year Avg. NCF	(J) Elig. Ratio	(K) Potential Payout	(L) Weighted Partic. Ratio	(M) Actual Payout
1960/61	686,212	334,609				13,633						
1961/62	754,045	344,286				10,059						
1962/63	918,829	356,012				16,034						
1963/64	1,121,622	373,460				18,564						
1964/65	1,110,796	403,090				17,044						
1965/66	1,154,993	434,243	0.662			19,447						
1966/67	1,360,246	471,145	0.673			21,323						
1967/68	1,219,986	514,284	0.749			15,976						
1968/69	835,993	553,321	0.719			15,088						
1969/70	767,403	521,775	0.665			16,714						
1970/71	962,911	511,132	0.527			19,110						
1971/72	1,204,050	514,555	0.632	325,137	878,913	23,623	37		0.9493			
1972/73	1,564,812	551,837	0.616	340,076	1,224,736	25,014	49		0.9339		0.8833	
1973/74	3,308,192	770,699	0.668	515,137	2,793,055	21,813	128		0.8594		0.8495	
1974/75	3,076,245	970,471	0.734	712,191	2,364,054	18,169	130		0.8693		0.8379	
1975/76	3,116,632	1,194,766	0.760	907,434	2,209,198	21,937	101		0.8676		0.8406	
1976/77	2,566,681	1,354,694	0.718	972,318	1,594,363	23,370	68	89	0.8911	432,808,251	0.8460	366,163,375
1977/78	3,086,304	1,466,171	0.734	1,076,280	2,010,024	27,698	73	95	0.8689	544,897,546	0.8468	461,406,051
1978/79	3,178,251	1,708,758	0.736	1,257,539	1,920,712	23,918	80	100	0.8650	406,140,613	0.8397	341,048,365
1979/80	4,389,133	2,026,088	0.751	1,521,405	2,867,728	28,535	100	90	0.8132	(234,741,952)	0.8206	-192,622,807
1980/81	6,166,694	2,295,058	0.780	1,790,590	4,376,104	28,469	154	84	0.7373	(1,453,683,285)	0.7817	-1,136,317,860
1981/82	5,362,209	2,880,068	0.795	2,288,950	3,073,259	30,743	100	95	0.7717	(116,352,245)	0.7714	-89,759,124
1982/83	5,974,951	3,097,453	0.770	2,386,100	3,588,851	35,864	100	101	0.7455	35,926,672	0.7749	27,840,628
1983/84	5,888,916	3,403,354	0.774	2,634,560	3,254,356	34,064	96	107	0.7500	290,606,771	0.7702	223,817,731
1984/85	5,411,341	3,559,896	0.788	2,804,648	2,606,693	27,793	94	110	0.7703	346,125,479	0.7760	268,601,662
1985/86	5,091,068	3,761,892	0.851	3,200,140	1,890,928	32,531	58	109	0.7809	1,282,562,447	0.7831	1,004,360,264
1986/87	4,011,089	3,524,057	0.776	2,733,082	1,278,007	36,490	35	89	0.8302	1,650,210,169	0.8001	1,320,406,448

Source: Historical Data for Receipts, Marketing, & Expenses - Statistics Canada and Dominion Bureau of Statistics
All other variables estimated

Table 2.a

MANITOBA CASH-FLOW CALCULATION: ORIGINAL TRIGGER

Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Expenses (000's)	(D) Market./ Product. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) Elig. Ratio	(H) Net Cash Flow (FxG)	(I) Preceding Five Yr. Avg. NCF	(J) Potential Payout (I-H)	(K) Particip. Ratio	(L) Weighted Partic. Ratio	(M) Payout (LxK)
1960/61	104,658	62,127										
1961/62	97,395	64,087										
1962/63	149,772	66,797										
1963/64	138,182	69,853										
1964/65	165,915	75,018										
1965/66	184,094	81,142	0.613									
1966/67	180,511	92,471	0.638									
1967/68	183,402	99,938	0.755									
1968/69	145,117	111,168	0.663									
1969/70	120,695	99,130	0.605									
1970/71	124,201	97,831	0.508									
1971/72	165,383	99,796	0.583	58,189	107,194	0.9385	100,601			0.7172		
1972/73	212,402	105,308	0.526	55,364	157,038	0.9278	145,700			0.7147	0.7157	
1973/74	463,074	147,677	0.629	92,872	370,202	0.8705	322,261			0.7013	0.7055	
1974/75	449,060	190,115	0.711	135,255	313,805	0.8737	274,172			0.7020	0.7016	
1975/76	447,304	240,740	0.747	179,942	267,362	0.8741	233,701			0.7021	0.7020	
1976/77	378,220	272,831	0.706	192,605	185,615	0.8899	165,178	215,287	50,108	0.7058	0.7036	35,258
1977/78	499,847	305,423	0.709	216,683	283,164	0.8621	244,116	228,202	(15,914)	0.6993	0.7019	(11,170)
1978/79	510,581	374,648	0.697	261,096	249,485	0.8596	214,457	247,886	33,429	0.6987	0.6990	23,367
1979/80	692,795	459,651	0.723	332,450	360,345	0.8180	294,762	226,325	(68,437)	0.6890	0.6931	(47,433)
1980/81	759,422	499,888	0.771	385,563	373,859	0.8028	300,134	230,443	(69,691)	0.6854	0.6872	(47,890)
1981/82	831,542	615,818	0.753	463,995	367,547	0.7863	289,002	243,729	(45,272)	0.6816	0.6835	(30,945)
1982/83	950,781	657,037	0.720	473,388	477,393	0.7590	362,341	268,494	(93,847)	0.6752	0.6780	(63,632)
1983/84	880,408	707,630	0.744	526,603	353,805	0.7776	275,119	292,139	17,020	0.7734	0.7176	12,213
1984/85	1,009,777	753,606	0.735	553,820	455,957	0.7472	340,691	304,272	(36,420)	0.7798	0.7769	(28,296)
1985/86	1,145,762	798,342	0.772	616,078	529,684	0.7123	377,294	313,457	(63,837)	0.7876	0.7839	(50,041)
1986/87	690,057	749,221	0.804	602,286	87,771	0.8167	71,682	328,890	257,207	0.8188	0.7926	203,857

Source: Historical Data for Receipts & Expenses - Statistics Canada and Dominion Bureau of Statistics.
All other variables estimated

Table 2.b

MANITOBA CASH-FLOW CALCULATION: TONNAGE TRIGGER												
Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Receipts (000's)	(D) Market./ Product. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) All Crops Marketing (Tonnes, 000's)	(H) NCF Per Tonne (F/G)	(I) 5 Year Avg. NCF	(J) Elig. Ratio	(K) Potential Payout (I-H)xGxJ	(L) Weighted Partic. Ratio	(M) Payout (Lxj)
1960/61	104,658	62,127				1,958						
1961/62	97,395	64,087				1,220						
1962/63	149,772	66,797				2,654						
1963/64	138,182	69,853				2,013						
1964/65	165,915	75,018				2,570						
1965/66	184,094	81,142	0.613			2,930						
1966/67	180,511	92,471	0.638			2,618						
1967/68	183,402	99,938	0.755			2,638						
1968/69	145,117	111,168	0.663			2,496						
1969/70	120,695	99,130	0.605			2,489						
1970/71	124,201	97,831	0.508			2,318						
1971/72	165,383	99,796	0.583	58,189	107,194	3,344	32		0.9385			
1972/73	212,402	105,308	0.526	55,364	157,038	3,457	45		0.9278		0.7157	
1973/74	463,074	147,677	0.629	92,872	370,202	3,259	114		0.8705		0.7055	
1974/75	449,060	190,115	0.711	135,255	313,805	2,598	121		0.8737		0.7016	
1975/76	447,304	240,740	0.747	179,942	267,362	3,132	85		0.8741		0.7020	
1976/77	378,220	272,831	0.706	192,605	185,615	3,487	53	79	0.8899	81,313	0.7036	57,215
1977/78	499,847	305,423	0.709	216,683	283,164	4,564	62	84	0.8621	85,093	0.7019	59,729
1978/79	510,581	374,648	0.697	261,096	249,485	3,846	65	87	0.8596	73,181	0.6990	51,155
1979/80	692,795	459,651	0.723	332,450	360,345	4,350	83	77	0.8180	(19,837)	0.6931	-13,749
1980/81	759,422	499,888	0.771	385,563	373,859	3,515	106	70	0.8028	(103,548)	0.6872	-71,157
1981/82	831,542	615,818	0.753	463,995	367,547	4,917	75	74	0.7863	(3,398)	0.6835	-2,323
1982/83	950,781	657,037	0.720	473,388	477,393	5,724	83	78	0.7590	(22,734)	0.6780	-15,414
1983/84	880,408	707,630	0.744	526,603	353,805	4,903	72	82	0.7776	39,222	0.7176	28,145
1984/85	1,009,777	753,606	0.735	553,820	455,957	5,485	83	84	0.7472	3,184	0.7769	2,474
1985/86	1,145,762	798,342	0.772	616,078	529,684	7,783	68	84	0.7123	88,192	0.7839	69,133
1986/87	690,057	749,221	0.804	602,286	87,771	5,893	15	76	0.8167	295,504	0.7926	2e+05

Source: Historical Data for Receipts, Marketing, & Expenses: Statistics Canada and Dominion Bureau of Statistics.
All other variables estimated

Table 3.a

SASKATCHEWAN CASH-FLOW CALCULATION: ORIGINAL TRIGGER												
Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Expenses (000's)	(D) Market./ Product. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) Elig. Ratio	(H) Net Cash Flow (FxG)	(I) Preceding Five Yr. Ave. NCF	(J) Potential Payout (I-H)	(K) Particip. Ratio	(L) Weighted Partic. Ratio	(M) Payout (LxJ)
1960/61	409,414	141,931										
1961/62	428,331	142,253										
1962/63	536,382	145,720										
1963/64	704,881	151,590										
1964/65	642,649	163,921										
1965/66	660,552	179,227	0.754									
1966/67	794,392	192,789	0.751									
1967/68	679,889	206,594	0.834									
1968/69	437,099	217,309	0.810									
1969/70	432,326	206,713	0.757									
1970/71	547,735	199,438	0.620									
1971/72	737,857	201,178	0.721	145,040	592,817	0.9602	569,223			0.8823		
1972/73	974,190	216,911	0.720	156,166	818,024	0.9371	766,570			0.8708	0.8757	
1973/74	2,005,854	297,437	0.752	223,734	1,782,120	0.8362	1,490,209			0.8205	0.8376	
1974/75	1,782,894	370,783	0.800	296,731	1,486,163	0.8580	1,275,128			0.8314	0.8255	
1975/76	1,774,785	452,784	0.855	387,195	1,387,590	0.8588	1,191,663			0.8318	0.8316	
1976/77	1,387,743	520,793	0.778	405,079	982,664	0.8966	881,057	1,058,558	177,502	0.8507	0.8398	149,072
1977/78	1,768,498	570,017	0.788	449,016	1,319,482	0.8594	1,133,963	1,120,925	(13,038)	0.8321	0.8402	-10,955
1978/79	1,759,153	677,532	0.784	531,254	1,227,899	0.8603	1,056,361	1,194,404	138,043	0.8326	0.8323	114,899
1979/80	2,343,412	803,790	0.810	651,321	1,692,091	0.8032	1,359,087	1,107,634	(251,453)	0.8041	0.8166	-205,327
1980/81	3,430,821	901,897	0.828	746,635	2,684,186	0.6969	1,870,610	1,124,426	(746,183)	0.7511	0.7734	-577,100
1981/82	2,779,761	1,104,696	0.834	921,108	1,858,653	0.7606	1,413,692	1,260,216	(153,476)	0.7828	0.7647	-117,370
1982/83	3,289,869	1,226,864	0.821	1,007,256	2,282,613	0.7107	1,622,253	1,366,742	(255,510)	0.7580	0.7695	-196,627
1983/84	3,113,922	1,386,137	0.822	1,139,906	1,974,016	0.7286	1,438,268	1,464,400	26,132	0.7724	0.7648	19,985
1984/85	2,725,496	1,446,065	0.830	1,199,796	1,525,700	0.7674	1,170,823	1,540,782	369,959	0.7792	0.7755	286,886
1985/86	2,595,325	1,564,769	0.899	1,406,640	1,188,685	0.7751	921,350	1,503,129	581,779	0.7878	0.7830	455,526
1986/87	2,091,181	1,538,352	0.806	1,240,213	850,968	0.8290	705,452	1,313,277	607,825	0.8208	0.8021	487,542

Source: Historical Data for Receipts & Expenses: Statistics Canada and Dominion Bureau of Statistics.
All other variables estimated

Table 3.b

SASKATCHEWAN CASH-FLOW CALCULATION: TONNAGE TRIGGER												
Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Expenses (000's)	(D) Market./ Product. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) All Crops Marketing (Tonnes, 000's)	(H) NCF Per Tonne (F/G)	(I) 5 Year Avg. NCF	(J) Elig. Ratio	(K) Potential Payout (I-H)*G* J	(L) Weighted Partic. Ratio	(M) Payout (KxL)
1960/61	409,414	141,931				8,169						
1961/62	428,331	142,253				5,573						
1962/63	536,382	145,720				9,493						
1963/64	704,881	151,590				11,847						
1964/65	642,649	163,921				9,769						
1965/66	660,552	179,227	0.754			11,582						
1966/67	794,392	192,789	0.751			12,567						
1967/68	679,889	206,594	0.834			8,692						
1968/69	437,099	217,309	0.810			7,948						
1969/70	432,326	206,713	0.757			9,196						
1970/71	547,735	199,438	0.620			10,867						
1971/72	737,857	201,178	0.721	145,040	592,817	14,547	41		0.9602			
1972/73	974,190	216,911	0.720	156,166	818,024	15,500	53		0.9371		0.8757	
1973/74	2,005,854	297,437	0.752	223,734	1,782,120	12,815	139		0.8362		0.8376	
1974/75	1,782,894	370,783	0.800	296,731	1,486,163	10,238	145		0.8580		0.8255	
1975/76	1,774,785	452,784	0.855	387,195	1,387,590	12,032	115		0.8588		0.8316	
1976/77	1,387,743	520,793	0.778	405,079	982,664	12,379	79	99	0.8966	213,463	0.8398	179,274
1977/78	1,768,498	570,017	0.788	449,016	1,319,482	15,966	83	106	0.8594	325,209	0.8402	273,251
1978/79	1,759,153	677,532	0.784	531,254	1,227,899	13,033	94	112	0.8603	202,934	0.8323	168,910
1979/80	2,343,412	803,790	0.810	651,321	1,692,091	15,088	112	103	0.8032	(106,732)	0.8166	-87,153
1980/81	3,430,821	901,897	0.828	746,635	2,684,186	14,549	184	97	0.6969	(889,712)	0.7734	-688,105
1981/82	2,779,761	1,104,696	0.834	921,108	1,858,653	15,160	123	111	0.7606	(138,668)	0.7647	-106,046
1982/83	3,289,869	1,226,864	0.821	1,007,256	2,282,613	19,144	119	119	0.7107	(188)	0.7695	-145
1983/84	3,113,922	1,386,137	0.822	1,139,906	1,974,016	17,461	113	127	0.7286	171,547	0.7648	131,193
1984/85	2,725,496	1,446,065	0.830	1,199,796	1,525,700	13,477	113	130	0.7674	176,863	0.7755	137,148
1985/86	2,595,325	1,564,769	0.899	1,406,640	1,188,685	15,764	75	131	0.7751	673,426	0.7830	527,284
1986/87	2,091,181	1,538,352	0.806	1,240,213	850,968	18,394	46	109	0.8290	952,087	0.8021	763,679

Source: Historical Data for Receipts, Marketing, & Expenses: Statistics Canada and Dominion Bureau of Statistics.
All other variables estimated

Table 4.a

ALBERTA CASH-FLOW CALCULATION: ORIGINAL TRIGGER												
Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Expenses (000's)	(D) Market./ Product. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) Elig. Ratio	(H) Net Cash Flow (FxG)	(I) Preceding Five Yr. Ave. NCF	(J) Potential Payout (I-H)	(K) Particip. Ratio	(L) Weighted Partic. Ratio	(M) Payout (LxJ)
1960/61	169,238	128,856										
1961/62	222,914	135,213										
1962/63	225,465	140,449										
1963/64	273,139	147,933										
1964/65	295,606	160,278										
1965/66	302,744	169,793	0.528									
1966/67	375,488	181,322	0.554									
1967/68	348,389	202,473	0.603									
1968/69	241,670	218,480	0.591									
1969/70	205,961	209,691	0.539									
1970/71	279,851	207,778	0.400									
1971/72	290,014	207,038	0.502	103,933	186,081	0.9476	176,330			0.8574		
1972/73	368,242	223,168	0.488	108,906	259,336	0.9382	243,309			0.8530	0.8548	
1973/74	821,189	316,070	0.546	172,574	648,615	0.8839	573,311			0.8271	0.8348	
1974/75	817,942	398,327	0.631	251,344	566,598	0.8843	501,042			0.8273	0.8272	
1975/76	871,701	487,969	0.610	297,661	574,040	0.8779	503,950			0.8242	0.8257	
1976/77	777,592	545,950	0.629	343,403	434,189	0.8892	386,081	399,588	13,507	0.8296	0.8265	11,164
1977/78	792,998	572,899	0.656	375,822	417,176	0.8873	370,160	441,539	71,378	0.8297	0.8296	59,219
1978/79	887,735	636,399	0.677	430,842	456,893	0.8760	400,238	466,909	66,671	0.8233	0.8264	55,095
1979/80	1,308,609	736,409	0.666	490,448	818,161	0.8255	675,392	432,294	(243,097)	0.7993	0.8082	(196,479)
1980/81	1,916,865	861,938	0.711	612,838	1,304,027	0.7526	981,411	467,164	(514,247)	0.7645	0.7787	(400,437)
1981/82	1,707,509	1,126,972	0.756	851,991	855,518	0.7777	665,336	562,656	(102,680)	0.7765	0.7693	(78,997)
1982/83	1,689,408	1,171,980	0.717	840,310	849,098	0.7799	662,212	618,507	(43,704)	0.7775	0.7770	(33,958)
1983/84	1,818,221	1,262,536	0.715	902,713	915,508	0.7655	700,821	676,918	(23,903)	0.7735	0.7754	(18,536)
1984/85	1,615,217	1,311,514	0.749	982,324	632,893	0.7865	497,770	737,034	239,264	0.7803	0.7763	185,746
1985/86	1,307,207	1,359,509	0.814	1,106,640	200,567	0.8281	166,089	701,510	535,421	0.7866	0.7819	418,633
1986/87	1,192,315	1,206,707	0.711	857,969	334,346	0.8382	280,249	538,446	258,197	0.8168	0.8056	207,994

Source: Historical Data for Receipts & Expenses - Statistics Canada and Dominion Bureau of Statistics.
All other variables estimated

Table 4.b

ALBERTA CASH-FLOW CALCULATION: TONNAGE TRIGGER											
Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Expenses (000's)	(D) Market./ Product. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) All Crops Marketing (Tonnes, 000's)	(H) NCF Per Tonne (F/G)	I) 5 Year Avg. NCF	(J) Elig. Ratio	(K) Potential Payout (I-H)*G*J	(L) Weighted Partic. Ratio	(M) Payout (KxL)
1960/61	169,238	128,856				3,432						
1961/62	222,914	135,213				3,139						
1962/63	225,465	140,449				3,741						
1963/64	273,139	147,933				4,588						
1964/65	295,606	160,278				4,562						
1965/66	302,744	169,793	0.528			4,774						
1966/67	375,488	181,322	0.554			5,941						
1967/68	348,389	202,473	0.603			4,488						
1968/69	241,670	218,480	0.591			4,378						
1969/70	205,961	209,691	0.539			4,824						
1970/71	279,851	207,778	0.400			5,695						
1971/72	290,014	207,038	0.502	103,933	186,081	5,475	34		0.9476			
1972/73	368,242	223,168	0.488	108,906	259,336	5,889	44		0.9382		0.8548	
1973/74	821,189	316,070	0.546	172,574	648,615	5,582	116		0.8839		0.8348	
1974/75	817,942	398,327	0.631	251,344	566,598	5,146	110		0.8843		0.8272	
1975/76	871,701	487,969	0.610	297,661	574,040	6,579	87		0.8779		0.8257	
1976/77	777,592	545,950	0.629	343,403	434,189	7,261	60	78	0.8892	119,559	0.8265	98,820
1977/78	792,998	572,899	0.656	375,822	417,176	6,994	60	83	0.8873	147,936	0.8296	122,735
1978/79	887,735	636,399	0.677	430,842	456,893	6,886	66	87	0.8760	122,168	0.8264	100,956
1979/80	1,308,609	736,409	0.666	490,448	818,161	8,823	93	77	0.8255	(117,258)	0.8082	-94,771
1980/81	1,916,865	861,938	0.711	612,838	1,304,027	10,087	129	73	0.7526	(426,077)	0.7787	-331,780
1981/82	1,707,509	1,126,972	0.756	851,991	855,518	10,388	82	82	0.7777	(6,404)	0.7693	-4,926
1982/83	1,689,408	1,171,980	0.717	840,310	849,098	10,705	79	86	0.7799	56,363	0.7770	43,794
1983/84	1,818,221	1,262,536	0.715	902,713	915,508	11,228	82	90	0.7655	72,776	0.7754	56,433
1984/85	1,615,217	1,311,514	0.749	982,324	632,893	8,483	75	93	0.7865	123,017	0.7763	95,501
1985/86	1,307,207	1,359,509	0.814	1,106,640	200,567	8,679	23	89	0.8281	476,545	0.7819	372,598
1986/87	1,192,315	1,206,707	0.711	857,969	334,346	11,826	28	68	0.8382	395,671	0.8056	318,737

Source: Historical Data for Receipts, Marketing, & Expenses: Statistics Canada and Dominion Bureau of Statistics.
All other variables estimated

Table 5.a

B.C. CASH-FLOW CALCULATION: ORIGINAL TRIGGER												
Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Expenses (000's)	(D) Market./ Product. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) Elig. Ratio	(H) Net Cash Flow (FxG)	(I) Preceding Five Yr. Ave. NCF	(J) Potential Payout (I-H)	(K) Particip. Ratio	(L) Weighted Partic. Ratio	(M) Payout (LxJ)
1960/61	2,812	1,696										
1961/62	5,405	2,733										
1962/63	7,210	3,046										
1963/64	5,420	4,084										
1964/65	6,626	3,874										
1965/66	7,603	4,081	0.386									
1966/67	9,855	4,564	0.437									
1967/68	8,306	5,279	0.473									
1968/69	12,107	6,364	0.522									
1969/70	8,421	6,242	0.478									
1970/71	11,124	6,086	0.325									
1971/72	10,796	6,543	0.428	2,801	7,995	0.9203	7,357			0.8216		
1972/73	9,978	6,450	0.467	3,014	6,964	0.9216	6,418			0.8222	0.8219	
1973/74	18,075	9,516	0.510	4,857	13,218	0.9091	12,017			0.8160	0.8182	
1974/75	26,349	11,246	0.582	6,547	19,802	0.8963	17,749			0.8098	0.8123	
1975/76	22,842	13,274	0.545	7,238	15,604	0.9017	14,070			0.8124	0.8109	
1976/77	23,126	15,121	0.510	7,719	15,407	0.9013	13,886	11,522	(2,364)	0.8122	0.8123	-1,920
1977/78	24,961	17,832	0.622	11,086	13,875	0.8984	12,465	12,828	363	0.8108	0.8115	294.6
1978/79	20,782	20,179	0.678	13,679	7,103	0.9049	6,427	14,037	7,610	0.8140	0.8119	6,179
1979/80	44,317	26,238	0.725	19,010	25,307	0.8686	21,981	12,919	(9,062)	0.7961	0.8001	-7,251
1980/81	59,586	31,335	0.715	22,420	37,166	0.8450	31,406	13,766	(17,640)	0.7846	0.7893	-13,924
1981/82	43,397	32,583	0.686	22,356	21,041	0.8700	18,306	17,233	(1,073)	0.7968	0.7891	-847
1982/83	44,893	41,572	0.715	29,731	15,162	0.8677	13,156	18,117	4,961	0.7957	0.7963	3,951
1983/84	76,365	47,051	0.674	31,725	44,640	0.8282	36,971	18,255	(18,716)	0.7746	0.7801	-14,601
1984/85	60,851	48,712	0.718	34,969	25,882	0.8273	21,412	24,364	2,952	0.7816	0.7772	2,294
1985/86	42,774	39,272	0.759	29,791	12,983	0.8735	11,341	24,250	12,909	0.7856	0.7830	10,108
1986/87	37,536	29,778	0.632	18,826	18,710	0.8831	16,523	20,237	3,714	0.8122	0.8014	2,976

Source: Historical Data for Receipts & Expenses: Statistics Canada and Dominion Bureau of Statistics.
All other variables estimated

Table 5.b

B.C. CASH-FLOW CALCULATION: TONNAGE TRIGGER												
Crop Year	(B) Gross Grain Receipts ($000's)	(C) Gross Grain Expenses (000's)	(D) Market./ Product. Ratio	(E) Net Grain Expenses (CxD)	(F) Net Grain Proceeds (B-E)	(G) All Crops Marketing (Tonnes, 000's)	(H) NCF Per Tonne (F/G)	(I) 5 Year Avg. NCF	(J) Elig. Ratio	(K) Potential Payout (I-H)*G*J	(L) Weighted Partic. Ratio	(M) Payout (KxL)
1960/61	2,812	1,696	0.000			72						
1961/62	5,405	2,733	0.000			127						
1962/63	7,210	3,046	0.000			145						
1963/64	5,420	4,084	0.000			116						
1964/65	6,626	3,874	0.000			143						
1965/66	7,603	4,081	0.386			160						
1966/67	9,855	4,564	0.437			197						
1967/68	8,306	5,279	0.473			157						
1968/69	12,107	6,364	0.522			266						
1969/70	8,421	6,242	0.478			204						
1970/71	11,124	6,086	0.325			230						
1971/72	10,796	6,543	0.428	2,801	7,995	255	31.2792		0.9203			
1972/73	9,978	6,450	0.467	3,014	6,964	167	41.5803		0.9216		0.8219	
1973/74	18,075	9,516	0.510	4,857	13,218	157	84.2568		0.9091		0.8182	
1974/75	26,349	11,246	0.582	6,547	19,802	186	106.2884		0.8963		0.8123	
1975/76	22,842	13,274	0.545	7,238	15,604	193	80.7394		0.9017		0.8109	
1976/77	23,126	15,121	0.510	7,719	15,407	243	63.4465	68.8288	0.9013	1,178	0.8123	956
1977/78	24,961	17,832	0.622	11,086	13,875	173	80.2942	75.2623	0.8984	(781)	0.8115	-634
1978/79	20,782	20,179	0.678	13,679	7,103	153	46.4397	83.0050	0.9049	5,061	0.8119	4,109
1979/80	44,317	26,238	0.725	19,010	25,307	273	92.5944	75.4416	0.8686	(4,072)	0.8001	-3,258
1980/81	59,586	31,335	0.715	22,420	37,166	318	117.0025	72.7028	0.8450	(11,891)	0.7893	-9,386
1981/82	43,397	32,583	0.686	22,356	21,041	277	76.0145	79.9555	0.8700	949	0.7891	748
1982/83	44,893	41,572	0.715	29,731	15,162	291	52.0310	82.4691	0.8677	7,696	0.7963	6,129
1983/84	76,365	47,051	0.674	31,725	44,640	472	94.5768	76.8164	0.8282	(6,943)	0.7801	-5,416
1984/85	60,851	48,712	0.718	34,969	25,882	347	74.5874	86.4438	0.8273	3,404	0.7772	2,645
1985/86	42,774	39,272	0.759	29,791	12,983	304	42.6973	82.8424	0.8735	10,663	0.7830	8,349
1986/87	37,536	29,778	0.632	18,826	18,710	376	49.7614	67.9814	0.8831	6,050	0.8014	4,848

Source: Historical Data for Receipts, Marketing, & Expenses: Statistics Canada; Agriculture Canada; Dominion Bureau of Statistics.
All other variables estimated

Table 6

A Comparison of WGSP Expense Data to the Expense Estimates Made Using Statistics Canada Data

Crop Year	WGSP Expense Estimates	Expense Estimates Using Stats. Cdn. Data	Difference
1971/72	511	515	0.70%
1972/73	549	552	0.52%
1973/74	730	771	5.29%
1974/75	899	971	7.37%
1975/76	1,197	1,195	-0.18%
1976/77	1,346	1,355	0.65%
1977/78	1,454	1,466	0.84%
1978/79	1,752	1,709	-2.52%
1979/80	2,020	2,026	0.31%
1980/81	2,181	2,295	4.98%
1981/82	2,777	2,880	3.58%
1982/83	3,150	3,098	-1.69%
1983/84	3,459	3,404	-1.63%
1984/85	3,574	3,560	-0.39%
1985/86	3,752	3,762	0.27%
1986/87	3,632	3,524	-3.06%

Source: Western Grain Stabilization Annual Report (1976 - 1986/87);
Statistics Canada.

Table 7

Participation by Total Annual Grain Receipt Levels - 1986-87 Crop Year										
	UNDER $25,000		$25,000 to $45,000		$45,000 to $60,000		Over $60,000			
	No.	%	No.	%	No.	%	No.	%	No.	%
Manitoba	11,7663	61.1	3,579	18.4	1,588	8.0	2,608	12.3	19,541	100
Saskatchewan	2,611	57.5	13,250	22.9	5,190	8.7	6,769	10.9	57,900	100
Alberta	22,736	66.8	5,446	15.9	2,293	6.5	3,876	10.8	34,351	100
B.C.	925	84.1	96	6.8	46	3.6	81	5.5	1,148	100
	68,118	60.3	22,371	19.8	8,848	8.1	13,334	11.8	112,940	100
All producers (1986/87 participants and non-participants										
	84,297	61.6	26,674	19.5	10,534	7.7	15,334	11.2	136,839	100
Participation Rate(%)	80.8		83.9		84.0		87.0		82.5	

Source: Exhibit F - Western Grain Stabilization Annual Report 1986-87

Table 8.a

STABILIZATION ACCOUNT
($millions)
- All Provinces -

Year	Producer Levy	Government Levy	Interest	Payout	Year-End Balance
1976	9.60	19.20	0.50	0.00	29.30
1977	28.00	56.00	5.10	0.00	118.40
1978	28.50	57.00	9.52	114.96	98.47
1979	43.50	87.00	7.59	252.95	-16.39
1980	48.30	96.60	6.77	0.00	135.28
1981	56.40	112.80	37.94	0.00	342.42
1982	55.50	111.00	53.66	0.00	562.58
1983	65.20	130.40	55.67	0.00	813.85
1984	26.65	62.15	48.67	222.92	728.41
1984/85	45.50	106.20	69.95	521.82	428.23
1985/86	29.90	89.70	30.86	858.74	-280.05
1986/87	27.40	82.20	-36.64	1395.47	-1602.56

Source: Levys and Payouts - Western Grain Stabilization Annual Reports (1976 to 1986/87).
Interest and Balance estimated.

Table 8.b

STABILIZATION ACCOUNT
($millions)
- Manitoba -

Year	Producer Levy	Government Levy	Interest	Payout	Year-End Balance
1976	4.00	8.00	0.21	0.00	12.21
1977	4.20	8.40	1.12	0.00	25.93
1978	5.10	10.20	1.93	17.87	25.28
1979	7.30	14.60	1.56	41.40	7.35
1980	8.00	16.00	1.65		33.00
1981	8.90	17.80	7.44		67.14
1982	9.10	18.20	9.96		104.40
1983	10.90	21.80	10.07		147.16
1984	4.20	9.79	8.69	36.13	133.72
1984/85	8.30	19.37	12.83	87.776	86.45
1985/86	6.00	18.00	6.22	150.797	-34.13
1986/87	4.80	14.40	-3.21	260.112	-278.25

Source: Levys and Payouts - Western Grain Stabilization Annual Reports (1976 to 1986/87).
Interest and Balance estimated.

Table 8.c

STABILIZATION ACCOUNT
($millions)
- Saskatchewan -

Year	Producer Levy	Government Levy	Interest	Payout	Year-End Balance
1977	16.70	33.40	2.25	0.00	52.35
1978	16.60	33.20	4.77	69.09	37.83
1979	25.30	50.60	3.77	150.33	-32.83
1980	27.60	55.20	2.63		52.61
1981	31.80	63.60	18.44		166.45
1982	31.40	62.80	27.48		288.13
1983	36.80	73.60	29.26		427.79
1984	16.00	37.31	25.94	125.94	381.11
1984/85	24.60	57.42	36.81	292.357	207.58
1985/86	16.30	48.90	15.37	477.144	-189.00
1986/87	15.00	45.00	-27.73	759.238	-915.97

Source: Levys and Payouts - Western Grain Stabilization Annual Reports (1976 to 1986/87).
Interest and Balance estimated.

Table 8.d

STABILIZATION ACCOUNT
($millions)
- Alberta -

Year	Producer Levy	Government Levy	Interest	Payout	Year-End Balance
1976	5.50	11.00	0.29	0.00	16.79
1977	6.90	13.80	1.69	0.00	39.18
1978	6.60	13.20	2.75	27.28	34.45
1979	10.60	21.20	2.20	59.53	8.93
1980	12.30	24.60	2.41		48.24
1981	15.30	30.60	11.73		105.87
1982	14.70	29.40	15.81		165.78
1983	17.10	34.20	15.94		233.02
1984	6.30	14.69	13.70	59.34	208.37
1984/85	12.30	28.71	19.82	138.317	130.89
1985/86	7.40	22.20	9.04	225.438	-55.91
1986/87	7.40	22.20	-5.66	368.036	-400.00

Source: Levys and Payouts - Western Grain Stabilization Annual Reports (1976 to 1986/87).
Interest and Balance estimated.

Table 8.e

STABILIZATION ACCOUNT
($millions)
- B.C. -

Year	Producer Levy	Government Levy	Interest	Payout	Year-End Balance
1976	0.10	0.20	0.01	0.00	0.31
1977	0.20	0.40	0.04	0.00	0.95
1978	0.20	0.40	0.07	0.72	0.90
1979	0.30	0.60	0.06	1.69	0.16
1980	0.40	0.80	0.07		1.43
1981	0.40	0.80	0.33		2.96
1982	0.30	0.60	0.41		4.27
1983	0.40	0.80	0.40		5.87
1984	0.15	0.35	0.34	1.51	5.21
1984/85	0.30	0.70	0.49	3.374	3.32
1985/86	0.20	0.60	0.23	5.36	-1.00
1986/87	0.20	0.60	-0.04	8.087	-8.33

Source: Levys and Payouts - Western Grain Stabilization Annual Reports (1976 to 1986/87).
Interest and Balance estimated.

Table 9

Test for Mean Differences in Producers Cash Flow Estimated Under the Proposed and Current Plans		
Level of Significance = 95%		
z = +1.96/-1.96		
	Proposed Plan	Current Plan
Manitoba		
Mean	2,823,800	2,808,200
Standard Deviation	556,920	555,250
Calculated z = 0.2805		
Saskatchewan		
Mean	9,879,800	9,892,600
Standard Deviation	2,127,100	2,127,600
Calculated z = -0.060		
Alberta		
Mean	5,046,100	5,034,100
Standard Deviation	955,900	953,790
Calculated z = 0.125		
B.C.		
Mean	141,730	141,170
Standard Deviation	49,603	49,313
Calculated z = 0.1132269		